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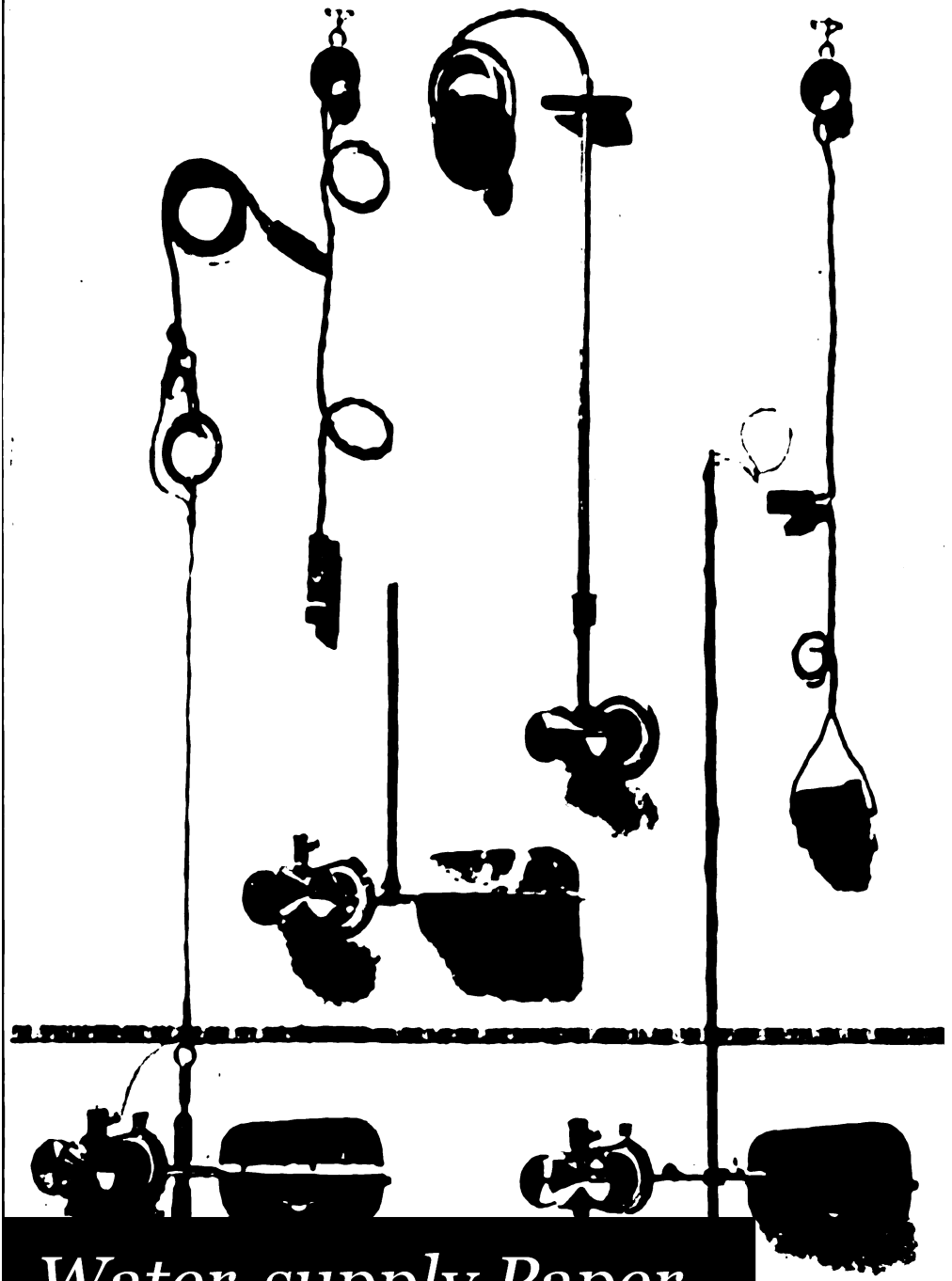

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UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, DIRECTOR

WATER-SUPPLY PAPER 353

SURFACE WATER SUPPLY OF THE UNITED STATES

1913

PART III. OHIO RIVER BASIN

BY

A. H. HORTON, W. E. HALL
AND H. J. JACKSON

Prepared in cooperation with the State of West Virginia

WASHINGTON
GOVERNMENT PRINTING OFFICE
1915

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SURFACE WATER SUPPLY OF OHIO RIVER BASIN FOR THE YEAR ENDING SEPTEMBER 30, 1913.

By A. H. HORTON, W. E. HALL, and H. J. JACKSON.

AUTHORIZATION AND SCOPE OF WORK.

This volume is one of a series of twelve reports presenting results of measurements of flow made on streams in the United States during 1913. Six of these reports contain data for the year ending September 30, and the other six for the calendar year, as indicated in the table on page 6.

The data presented in these reports were collected by the United States Geological Survey under authority implied in the organic law (20 Stat. L., p. 394) which contains the following paragraph:

> *Provided*, That this officer [the Director] shall have the direction of the geological survey and the classification of public lands and examination of the geological structure, mineral resources, and products of the national domain.

The work was begun in 1888 in connection with special studies of water supply for irrigation. Since the fiscal year ending June 30, 1895, successive sundry civil bills passed by Congress have carried the following item and appropriations:

> For gaging the streams and determining the water supply of the United States, and for the investigation of underground currents and artesian wells, and for the preparation of reports upon the best methods of utilizing the water resources.

Annual appropriations for the fiscal years ending June 30, 1895–1914.

1895	$12,500
1896	20,000
1897 to 1900, inclusive	50,000
1901 to 1902, inclusive	100,000
1903 to 1906, inclusive	200,000
1907	150,000
1908 to 1910, inclusive	100,000
1911 to 1914, inclusive	150,000

In the execution of the work many private and State organizations have cooperated, either by furnishing data or by assisting in collecting data. Acknowledgments for cooperation of the first kind are made

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in connection with the description of each station affected, and of the second kind on page 16.

Measurements of stream flow have been made at about 3,000 points in the United States, and also at many points in small areas in Seward Peninsula and the Yukon-Tanana region, Alaska, and in the Hawaiian Islands. In July, 1913, 1,388 gaging stations were being maintained by the Survey and the cooperating organizations in the United States, and many miscellaneous discharge measurements were made at other points. In connection with this work data were also collected in regard to precipitation, evaporation, storage reservoirs, river profiles, and water power in many sections of the country and will be made available in the regular water-supply papers from time to time.

PUBLICATIONS.

A report has been prepared for each year embodying the stream-flow data collected during that year. An index to the reports containing stream-flow measurements prior to 1904 has been published as Water-Supply Paper 119. Circulars are also available giving complete lists of the gaging stations maintained by the Survey to date, and a list of the reports relating to the water supply of the country.

Prior to 1901 gage heights and discharge measurements were published in water-supply papers or bulletins and estimates of monthly discharge in annual reports; since 1901 both classes of data have been published in water-supply papers, and they are now being published in twelve parts, as shown in the following table:

Papers on surface water supply of the United States, 1913.

Part.	No.	Title.	Year used.
I	351	North Atlantic basins	Calendar year.
II	352	South Atlantic and eastern Gulf of Mexico basins	Do.
III	353	Ohio River Basin	Year ending Sept. 30.
IV	354	St. Lawrence River Basin	Calendar year.
V	355	Upper Mississippi River and Hudson Bay basins	Year ending Sept. 30.
VI	356	Missouri River Basin	Calendar year.
VII	357	Lower Mississippi River Basin	Do.
VIII	358	Western Gulf of Mexico basins	Year ending Sept. 30.
IX	359	Colorado River Basin	Calendar year.
X	360	Great Basin	Year ending Sept. 30.
XI	361	Pacific basins in California	Do.
XII	362	North Pacific basins	Do.

A list of reports containing stream-flow data is presented in the following table:

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Stream-flow data in reports of the United States Geological Survey.

[A—Annual Report; B—Bulletin; WS—Water-Supply Paper.]

Report.	Character of data.	Year.
10th A, pt. 2	Description information only	
11th A, pt. 2	Monthly discharge	1884 to Sept. 1890.
12th A, p. 2	do	1884 to June 30, 1891.
13th A, pt. 3	Mean discharge in second-feet	1884 to Dec. 31, 1892.
14th A, pt. 2	Monthly discharge (long-time records, 1871 to 1893)	1888 to Dec. 31, 1893.
B 131	Descriptions, measurements, gage heights, and ratings	1893 and 1894.
16th A, pt. 2	Descriptive information only	
B 140	Descriptions, measurements, gage heights, ratings and monthly discharge (also many data covering earlier years).	1895.
WS 11	Gage heights (also gage heights for earlier years)	1896.
18th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also similar data for some earlier years).	1895 and 1896.
WS 15	Descriptions, measurements, and gage heights, for eastern United States, eastern Mississippi River, and Missouri River above junction with Kansas.	1897.
WS 16	Descriptions, measurements, and gage heights, for western Mississippi River below junction of Missouri and Platte, and western United States.	1897.
19th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also some long-time records).	1897.
WS 27	Measurements, ratings, and gage heights, for eastern United States, eastern Mississippi River, and Missouri River.	1898.
WS 28	Measurements, ratings, and gage heights, for Arkansas River and western United States.	1898.
20th A, pt. 4	Monthly discharge (also for many earlier years)	1898.
WS 35 to 39	Descriptions, measurements, gage heights, and ratings	1899.
21st A, pt. 4	Monthly discharge	1899.
WS 47 to 52	Descriptions, measurements, gage heights, and ratings	1900.
22d A, pt. 4	Monthly discharge	1900.
WS 65, 66	Descriptions, measurements, gage heights, and ratings	1901.
WS 75	Monthly discharge	1901.
WS 82 to 85	Complete data	1902.
WS 97 to 100	do	1903.
WS 124 to 135	do	1904.
WS 165 to 178	do	1905.
WS 201 to 214	do	1906.
WS 241 to 252	do	1907–8.
WS 261 to 272	do	1909.
WS 281 to 292	do	1910.
WS 301 to 312	do	1911.
WS 321 to 332	do	1912.
WS 351 to 362	do	1913.

NOTE.—No data regarding stream flow are given in the 15th and 17th annual reports.

The table on page 8 gives, by years and drainage basins, the numbers of the papers on surface-water supply published from 1899 to 1913. The data for any particular station will be found in the reports covering the years during which the station was maintained. For example, data for any station in the area covered by Part I are published in Water-Supply Papers 97, 124, 165, 201, 241, 261, 281, 301, 321, and 351, which contain records for the New England streams from 1903 to 1913. The year covered by the report is indicated at the head of the column in which the paper is listed.

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Numbers of water-supply papers containing results of stream measurements, 1899–1913.

	[a] 1899	[b] 1900	1901	1902	1903	1904	1905	1906	1907–8	1909	1910	1911	1912
North Atlantic coast (St. John River to York River)	35	47, [c] 48	65, 75	82	97	[d] 124, [e] 125, [f] 126	[d] 165, [e] 166, [f] 167	[d] 201, [e] 202, [f] 203	241	261	281	301	321
South Atlantic coast and eastern Gulf of Mexico (James River to the Mississippi)	[g] 35, 36	48	65, 75	[g] 82, 83	[g] 97, 98	[f] 126, 127	[f] 167, 168	[f] 203, 204	242	262	282	302	322
Ohio River basin	36	48, [h] 49	65, 75	83	98	128	169	205	243	263	283	303	323
St. Lawrence River and Great Lakes	36	49	65, 75	[i] 82, 83	97	129	170	206	244	264	284	304	324
Hudson Bay and upper Mississippi River	36	49	[j] 65, 66, 75	[j] 83, 85	[j] 98, 99, [k] 100	[j] 128, 130	171	207	245	265	285	305	325
Missouri River	[l] 36, 37	49, [m] 50	66, 75	84	99	130, [n] 131	172	208	246	266	286	306	326
Lower Mississippi River	37	50	[j] 65, 66, 75	[j] 83, 84	[j] 98, 99	[j] 128, 131	[j] 169, 173	[j] 205, 209	247	267	287	307	327
Western Gulf of Mexico	37	50	66, 75	84	99	132	174	210	248	268	288	308	328
Colorado River	[o] 37, 38	50	66, 75	85	100	133	175, [e] 177	211	249	269	289	309	329
Great Basin	38, [p] 39	51	66, 75	85	100	133, [q] 134	176, [q] 177	212, [q] 213	250, [q] 251	270, [q] 271	290	310	330
Pacific coast in California	38, [r] 39	51	66, 75	85	100	134	177	213	251	271	291	311	331
North Pacific coast	38	51	66, 75	85	100	135	[t] 177, 178	214	252	272	292	[u] 312	[u] 332

[a] Rating tables and index to Water-Supply Papers 35–39 contained in Water-Supply Paper 39. Estimates for 1899 in Twenty-first Annual Report, part 4.

[b] Rating tables and index to Water-Supply Papers 47–52 and data on precipitation, wells, and irrigation in California and Utah contained in Water-Supply Paper 52. Estimates for 1900 in Twenty-second Annual Report, part 4.

[c] Wissahickon and Schuylkill rivers to James River.

[d] New England rivers only.

[e] Hudson River to Delaware River, inclusive.

[f] Susquehanna River to Yadkin River, inclusive.

[g] James River only.

[h] Scioto River.

[i] Lake Ontario and tributaries to St. Lawrence River proper.

[j] Tributaries of Mississippi from east.

[k] Hudson Bay only.

[l] Gallatin River.

[m] Loup and Platte rivers near Columbus, Nebr., and all tributaries below junction with Platte.

[n] Platte and Kansas rivers.

[o] Green and Gunnison rivers and Grand River above junction with Gunnison.

[p] Mohave River only.

[q] Great Basin in California, excepting Truckee and Carson drainage basins.

[r] Kings and Kern rivers and south Pacific coast drainage basins.

[s] Below junction with Gila.

[t] Rogue, Umpqua, and Siletz rivers only.

[u] In three parts: *A*, Pacific basins in Washington and upper Columbia River; *B*, Snake River; *C*, Lower Columbia River and Rogue, Umpqua, and Siletz rivers.

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Water-supply papers and other publications of the United States Geological Survey containing data in regard to the water resources of the United States may be obtained or consulted as indicated below:

1. Copies may be obtained free of charge by applying to the Director of the Geological Survey, Washington, D. C. The edition printed for free distribution is, however, small and is soon exhausted.

2. Copies may be purchased at nominal cost from the superintendent of documents, Government Printing Office, Washington, D. C., who will on application furnish lists giving prices.

3. Sets of the reports may be consulted in the libraries of the principal cities in the United States.

4. Complete sets are available for consultation in the local offices of the water-resources branch of the Geological Survey, as follows:

Albany, N. Y., room 18, Federal Building.
Atlanta, Ga., Post Office Building.
Madison, Wis., Capitol Building.
Newport, Ky., Federal Building. (Temporarily discontinued.)
St. Paul, Minn., Old Capitol Building.
Helena, Mont., Montana National Bank Building.
Denver, Colo., 302 Chamber of Commerce Building.
Salt Lake City, Utah, Brooks Arcade.
Boise, Idaho, 615 Idaho Building.
Portland, Oreg., 416 Couch Building.
San Francisco, Cal., 328 Customhouse.
Santa Fe, N. Mex., Capitol Building.
Honolulu, Hawaii, Kapiolani Building.

A list of the Geological Survey's publications will be sent on application to the Director of the United States Geological Survey, Washington, D. C.

DEFINITION OF TERMS.

The volume of water flowing in a stream—the "run-off" or "discharge"—is expressed in various terms, each of which has become associated with a certain class of work. These terms may be divided into two groups—(1) those which represent a rate of flow, as second-feet, gallons per minute, miner's inches, and discharge in second-feet per square mile, and (2) those which represent the actual quantity of water, as run-off (depth in inches), acre-feet, and millions of cubic feet. The units used in this series of reports are second-foot, second-feet per square mile, run-off in inches, acre-foot, and millions of cubic feet. They may be defined as follows:

"Second-foot" is an abbreviation for "cubic foot per second" and is a unit for the rate of discharge of water flowing in a stream. A second-foot is the rate of discharge of water flowing in a channel of rectangular cross-section 1 foot wide and 1 foot deep at an average velocity of 1 foot a second. It is generally used as a fundamental unit from which others are computed by the use of the factors given in the tables of convenient equivalents (p. 10).

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"Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly both as regards time and area.

"Run-off (depth in inches)" is the depth to which the drainage area would be covered if all the water flowing from it in a given period were conserved and uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

An "acre-foot" is equivalent to 43,560 cubic feet, and is the quantity required to cover an acre to the depth of 1 foot. The term is commonly used in connection with storage for irrigation.

"Millions of cubic feet" is a unit used to express quantities of water stored in reservoirs, and is most frequently used in studies of flood control.

The following terms used in these reports are not in common use, and may be defined as follows:

"Control," "controlling section," and "point of control" are terms used to designate that cross section of the stream below the gage which controls or regulates the height of the water surface at the gage. It should be noted that the control may not be the same cross section at all stages.

"Discharge relation" is an abbreviation for the term "relation of gage height to discharge."

The "point of zero flow" for a given gaging station is that point on the gage—the gage height—to which the surface of the river would fall if there were no flow.

CONVENIENT EQUIVALENTS.

The following is a list of convenient equivalents for use in hydraulic computations:

Table for converting velocity in feet per second into velocity in miles per hour.

[1 foot per second=0.681818 · · miles per hour, or very nearly ⅔ mile per hour. 1 mile per hour=1.4666 · feet per second, or very nearly 1½ feet per second. In computing the table the values 0.68182 and 1.4667 were used.]

Units.	Tenths.									
	0	1	2	3	4	5	6	7	8	9
0	0.000	0.068	0.136	0.205	0.273	0.341	0.409	0.477	0.545	0.614
1	.682	.750	.818	.886	.955	1.02	1.09	1.16	1.23	1.30
2	1.36	1.43	1.50	1.57	1.64	1.70	1.77	1.84	1.91	1.98
3	2.05	2.11	2.18	2.25	2.32	2.39	2.45	2.52	2.59	2.66
4	2.73	2.80	2.86	2.93	3.00	3.07	3.14	3.20	3.27	3.34
5	3.41	3.48	3.55	3.61	3.68	3.75	3.82	3.89	3.95	4.02
6	4.09	4.16	4.23	4.30	4.36	4.43	4.50	4.57	4.64	4.70
7	4.77	4.84	4.91	4.98	5.05	5.11	5.18	5.25	5.32	5.39
8	5.45	5.52	5.59	5.66	5.73	5.80	5.86	5.93	6.00	6.07
9	6.14	6.20	6.27	6.34	6.41	6.48	6.55	6.61	6.68	6.75

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Table for converting discharge in second-feet per square mile into run-off in depth in inches over the area.

Discharge in second-feet per square mile.	Run-off in inches.				
	1 day.	28 days.	29 days.	30 days.	31 days.
1.....	0.03719	1.041	1.079	1.116	1.153
2.....	.07438	2.083	2.157	2.231	2.306
3.....	.11157	3.124	3.236	3.347	3.459
4.....	.14876	4.165	4.314	4.463	4.612
5.....	.18595	5.207	5.393	5.578	5.764
6.....	.22314	6.248	6.471	6.694	6.917
7.....	.26033	7.289	7.550	7.810	8.070
8.....	.29752	8.331	8.628	8.926	9.223
9.....	.33471	9.372	9.707	10.041	10.376

NOTE.—For part of month multiply the values for one day by the number of days.

Table for converting discharge in second-feet into run-off in acre-feet.

Discharge in second-feet.	Run-off in acre-feet.				
	1 day.	28 days.	29 days.	30 days.	31 days.
1.....	1.983	55.54	57.52	59.50	61.49
2.....	3.967	111.1	115.0	119.0	123.0
3.....	5.950	166.6	172.6	178.5	184.5
4.....	7.934	222.1	230.1	238.0	246.0
5.....	9.917	277.7	287.6	297.5	307.4
6.....	11.90	333.2	345.1	357.0	368.9
7.....	13.88	388.8	402.6	416.5	430.4
8.....	15.87	444.3	460.2	476.0	491.9
9.....	17.85	499.8	517.7	535.5	553.4

NOTE.—For part of a month multiply values for one day by the number of days.

Table for converting discharge in second-feet into run-off in millions of gallons.

Discharge in second-feet.	Run-off in millions of gallons.				
	1 day.	28 days.	29 days.	30 days.	31 days.
1.....	0.6463	18.10	18.74	19.39	20.04
2.....	1.293	36.20	37.48	38.78	40.08
3.....	1.939	54.30	56.22	58.17	60.12
4.....	2.585	72.40	74.96	77.56	80.16
5.....	3.232	90.50	93.70	96.95	100.2
6.....	3.878	108.6	112.4	116.3	120.2
7.....	4.524	126.7	131.2	135.7	140.3
8.....	5.170	144.8	149.9	155.1	160.3
9.....	5.817	162.9	168.7	174.5	180.4

NOTE.—For part of a month multiply the value for one day by the number of days.

Table for converting discharge in second-feet into run-off in millions of cubic feet.

Discharge in second-feet.	Run-off in millions of cubic feet.				
	1 day.	28 days.	29 days.	30 days.	31 days.
1.....	0.0864	2.419	2.506	2.592	2.678
2.....	.1728	4.838	5.012	5.184	5.356
3.....	.2592	7.257	7.518	7.776	8.034
4.....	.3456	9.676	10.024	10.368	10.712
5.....	.4320	12.095	12.530	12.960	13.390
6.....	.5184	14.514	15.036	15.552	16.068
7.....	.6048	16.933	17.542	18.144	18.746
8.....	.6912	19.352	20.048	20.736	21.424
9.....	.7776	21.771	22.554	23.328	24.102

NOTE.—For part of a month multiply values for one day by the number of days.

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1 second-foot equals 40 California miner's inches (law of March 23, 1901).
1 second-foot equals 38.4 Colorado miner's inches.
1 second-foot equals 40 Arizona miner's inches.
1 second-foot equals 7.48 United States gallons per second; equals 448.8 gallons per minute; equals 646,317 gallons for one day.
1 second-foot for one year covers 1 square mile 1.131 feet, or 13.572 inches deep.
1 second-foot for one year equals 31,536,000 cubic feet.
1 second-foot equals about 1 acre-inch per hour.
1 second-foot for one day equals 86,400 cubic feet.
1,000,000,000 (1 United States billion) cubic feet equals 11,570 second-feet for one day.
1,000,000,000 cubic feet equals 414 second-feet for one 28-day month.
1,000,000,000 cubic feet equals 399 second-feet for one 29-day month.
1,000,000,000 cubic feet equals 386 second-feet for one 30-day month.
1,000,000,000 cubic feet equals 373 second-feet for one 31-day month.
100 California miner's inches equals 18.7 United States gallons per second.
100 California miner's inches for one day equals 4.96 acre-feet.
100 Colorado miner's inches equals 2.60 second-feet.
100 Colorado miner's inches equals 19.5 United States gallons per second.
100 Colorado miner's inches for one day equals 5.17 acre-feet.
100 United States gallons per minute equals 0.223 second-foot.
100 United States gallons per minute for one day equals 0.442 acre-foot.
1,000,000 United States gallons per day equals 1.55 second-feet.
1,000,000 United States gallons equals 3.07 acre-feet.
1,000,000 cubic feet equals 22.95 acre-feet.
1 acre-foot equals 325,850 gallons.
1 inch deep on 1 square mile equals 2,323,200 cubic feet.
1 inch deep on 1 square mile equals 0.0737 second-foot per year.
1 foot equals 0.3048 meter.
1 mile equals 1.60935 kilometers.
1 mile equals 5,280 feet.
1 acre equals 0.4047 hectare.
1 acre equals 43,560 square feet.
1 acre equals 209 feet square, nearly.
1 square mile equals 2.59 square kilometers.
1 cubic foot equals 0.0283 cubic meter.
1 cubic foot of water weighs 62.5 pounds.
1 cubic meter per minute equals 0.5886 second-foot.
1 horsepower equals 550 foot-pounds per second.
1 horsepower equals 76.0 kilogram-meters per second.
1 horsepower equals 746 watts.
1 horsepower equals 1 second-foot falling 8.80 feet.
1½ horsepower equal about 1 kilowatt.

To calculate water power quickly: $\frac{\text{Sec.-ft.} \times \text{fall in feet}}{11}$ = net horsepower on water-wheel realizing 80 per cent of theoretical power.

EXPLANATION OF DATA.

The data presented in this report cover the year beginning October 1, 1912, and ending September 30, 1913, and not, as in previous reports, the calendar year. At the 1st of January in most parts of the country a large amount of precipitation for the preceding three months is stored, either as ground water, in the form of snow, or in

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lakes. This stored water passes off in the streams during the spring break-up. At the end of September the only stored water available for run-off in the streams is possibly a small amount held in ground storage. Therefore the run-off for a year, beginning with October 1, is practically all derived from precipitation occurring within that year.

Records of gage height on Ohio River as far back as 1838 show that high-water periods extending from December into January are much more frequent and pronounced on the Ohio than high-water periods extending from September into October. In other words, much of the precipitation during December runs off in the flood flow of January in the next calendar year. October 1, therefore, is a much better starting point than January 1 for what may be termed the run-off or water year.

For each regular current-meter gaging station the following data, so far as available, are given: Description of the station, list of discharge measurements, table of daily gage height, table of daily discharge, table of monthly and yearly discharge and run-off. For stations located at weirs or dams the gage-height table is usually omitted.

In addition to statements regarding the location and installation of current-meter stations, the descriptions give information in regard to any conditions which may affect the constancy of the relation of gage height to discharge, covering such points as ice, logging, shifting channels, and backwater; also information regarding diversions which decrease the total flow at the measuring section. Statements are also made regarding the accuracy of the data.

The table of daily gage height shows the daily fluctuations of the surface of the river as found from the mean of the gage readings taken each day, usually in the morning and in the evening, though at many stations only one reading is made each day. At a comparatively few stations automatic gages are used, some of which give a continuous record of river stage in the form of a hydrograph and others a record printed at regular intervals, from which the mean daily gage height can be computed. The gage height given in the table represents the elevation of the surface of the water above the zero of the gage. All gage heights affected by the presence of ice in the streams or by backwater from obstructions are published as recorded, with suitable footnotes. The rating table is not applicable for such periods unless the proper corrections to the gage heights are known and applied. Attention is called to the fact that the zero of the gage is placed at an arbitrary datum and has no relation to zero flow or the bottom of the river. In general the zero is located somewhat below the gage height of the lowest known flow, so that negative readings shall not occur.

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In the tables of daily gage height the use of zeros in the hundredths place indicates the limits of accuracy to which the gage was read and to which the mean daily gage height was computed. If a gage is read to tenths or half tenths once a day or to tenths twice a day, no zeros appear in the hundredths place for any stage. If the gage is read to half tenths twice a day or to quarter tenths or hundredths, regardless of the number of readings a day, the gage heights are published to hundredths, and zeros appear in the hundredths place, below a certain limiting stage. This limiting stage is so selected that the average error in the mean daily discharge, resulting from not using the mean daily gage height to hundredths above that stage, shall not be greater than 2 per cent. For automatic gages the allowable average error of the daily discharge has been taken as 1 per cent. The selection of the percentage is arbitrary, but it should be noted that the maximum error will in all cases be twice the average error. In like manner half tenths are used from the hundredths limit to another higher limit, above which only tenths are used. It is the aim to have the gage-height observations at each gaging station recorded to the degree of refinement required by the above method of use, but in practice it is found necessary, in order to avoid confusion in the gage observer's record, to have the observations for all stages recorded to the degree of refinement required for low stages, which usually necessitates readings to hundredths of a foot.

The discharge measurements and gage heights are the base data from which rating tables, daily discharge tables, and monthly discharge tables are computed.

The rating table gives, either directly or by interpolation, the discharge in second-feet corresponding to every stage of the river recorded during the period for which it is applicable. It is not published in this report, but can be determined from the tables of daily gage heights and daily discharge by plotting gage heights in feet as ordinates and discharge in second-feet as abscissas.

The table of daily discharge determined from the rating table gives the discharge in second-feet corresponding to the mean of the gage readings observed each day.

In the table of monthly discharge the column headed "Maximum" gives the mean flow, as determined from the rating table, for the day when the mean gage height was highest. As the gage height is the mean for the day, it does not indicate correctly the stage when the water surface was at crest height and the corresponding discharge was consequently larger than given in the maximum column. Likewise in the column at "Minimum" the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" is the average flow in cubic feet for each second dur-

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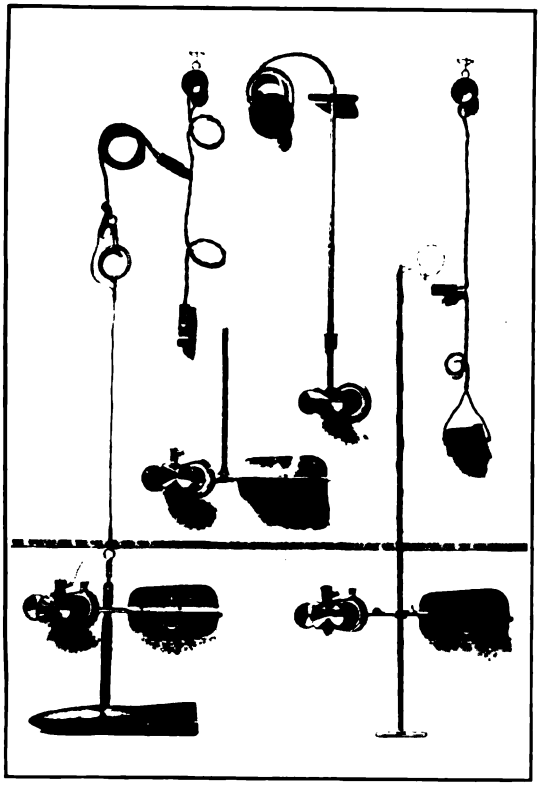
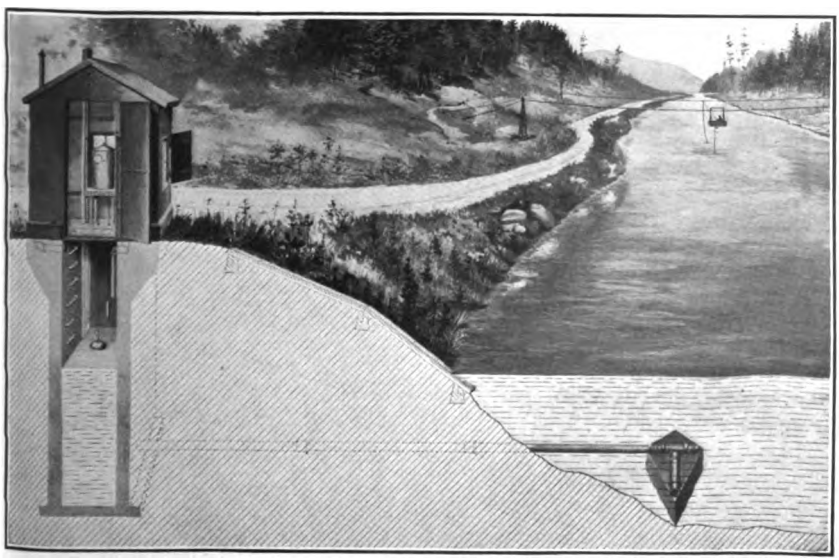


A. PRICE CURRENT METERS.



B. TYPICAL GAGING STATIONS.

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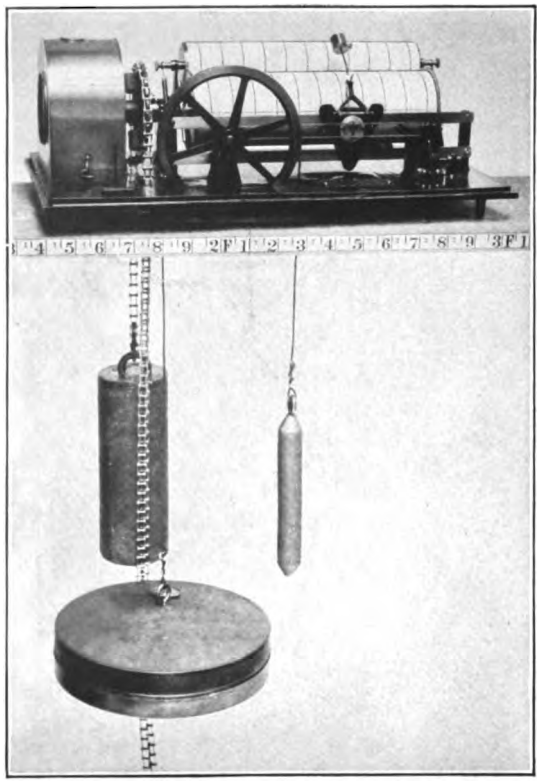
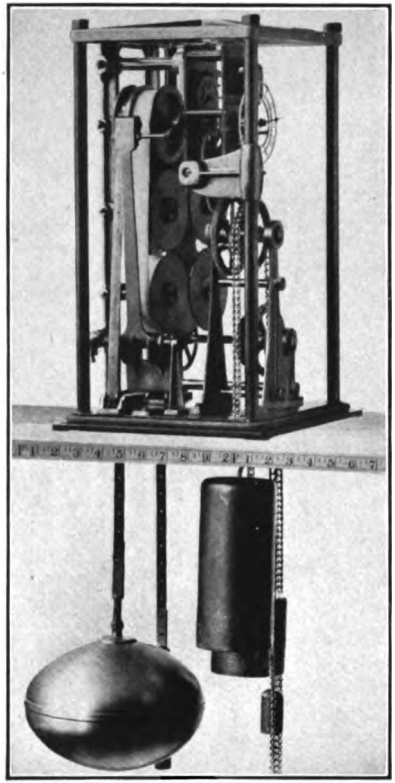
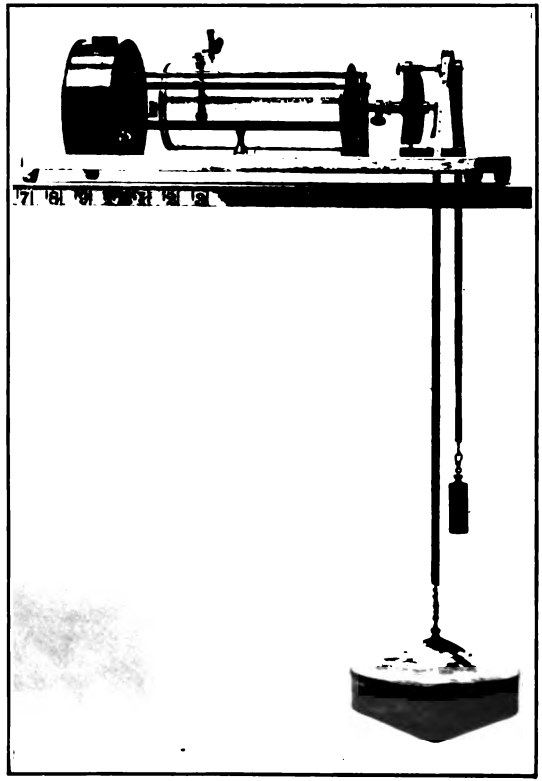


A. STEVENS.



B. GURLEY.



C. FRIEZ.

AUTOMATIC GAGES.

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ing the month. On this the computations for the remaining columns, which are defined on page 9, are based.

The base data presented in this report, unless otherwise stated in description of station, have been collected by the methods commonly used at current-meter gaging stations and described in standard textbooks. (See Pls. I and II.)

ACCURACY OF FIELD DATA AND COMPUTED RESULTS.

The accuracy of stream-flow data depends (1) on permanence of the relation between discharge and stage, and (2) on the accuracy of observations of stage, measurements of discharge, and interpretation of data.

In order to give engineers and others information regarding the probable accuracy of the computed results, footnotes are added to the daily discharge tables, stating the probable accuracy of the rating curves used, and an accuracy column is inserted in the monthly discharge table. For the rating curves, "well defined" indicates, in general, that the rating is probably accurate within 5 per cent; "fairly well defined," within 10 per cent; "poorly defined" or "approximate," within 15 to 25 per cent. These notes are very general and are based on the plotting of the individual measurements with reference to the mean rating curve.

The accuracy column in the monthly discharge table does not apply to the maximum or minimum nor to any individual day, but to the monthly mean. It is based on the accuracy of the rating, the probable reliability of the observer, the number of gage readings per day, the range of the fluctuation in stage, and knowledge of local conditions. In this column, A indicates that the mean monthly flow is probably accurate within 5 per cent; B, within 10 per cent; C, within 15 per cent; D, within 25 per cent. Special conditions are covered by footnotes.

Even though the monthly means for any station may represent with a high degree of accuracy the quantity of water flowing past the gage, the figures showing discharge per square mile and depth of run-off in inches may be subject to gross errors, which result from including in the measured drainage area large noncontributing districts or omitting estimates of water diverted for irrigation or other use. "Second-feet per square mile" and "run-off (depth in inches)" have therefore not been computed for stations draining areas having an annual rainfall of less than 20 inches, nor for stations draining areas of over 20 inches of rainfall for which the computations would probably be uncertain and misleading because of the presence of large noncontributing districts in the measured drainage area, of omitting estimates of water diverted for irrigation or

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other use, or of artificial control or unusual natural control of the flow of the river above the gaging station. All values of "second-feet per square mile" and "run-off (depth in inches)" previously published by the Survey should be used with extreme caution, and such values in this report should be used with care because of possible inherent sources of error not known to the Survey.

In general, the base data collected each year by the Survey are published, not only to comply with the law, but also to afford any engineer the means of examining and adjusting to his own needs the results of the computations. The table of monthly discharge is so arranged as to give only a general idea of the flow at the station and should not be used for other than preliminary estimates. The determinations of daily discharge allow more detailed studies of the variation in flow by which the period of deficiency may be determined.

It should be borne in mind that the observations in each succeeding year may be expected to throw new light on data already collected and published, and the engineer who makes use of the figures presented in these papers should verify all ratings and make such adjustments for earlier years as may seem necessary.

COOPERATION.

Work in West Virginia during the year ending September 30, 1913, was done in cooperation with the State Geological Survey, I. C. White, State geologist. The State Geological Survey of Tennessee, A. H. Purdue, State geologist; the department of public service of the city of Cincinnati, V. T. Price, director; and F. W. Scheidenhelm, of the Hydro-Electric Co. of West Virginia, also cooperated with the United States Geological Survey during the year ending September 30, 1913.

DIVISION OF WORK.

Field data for Allegheny River at Red House, N. Y., were collected under the direction of C. C. Covert, district engineer, assisted by G. H. Canfield and C. S. De Golyer.

Field data for the Ohio River basin, except those for the Allegheny at Red House, N. Y., and for the basin of Tennessee River, were collected under the direction of A. H. Horton, district engineer, assisted by G. C. Stevens, H. J. Jackson, C. T. Bailey, and W. R. King. Stations in Pennsylvania are maintained and stream-flow data collected by the Water Supply Commission of Pennsylvania.

Field data in the Tennessee River basin were collected under the direction of W. E. Hall, district engineer, assisted by B. M. Hall, jr.

The ratings, special estimates, and studies of the completed data, except Tennessee River at Chattanooga, Florence, and Johnsonville, were made by W. E. Hall, A. H. Horton, and B. J. Peterson.

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The completed data, except Tennessee River at Chattanooga, Florence, and Johnsonville, were prepared for publication under the direction of H. J. Jackson, assistant engineer, by B. J. Peterson.

The ratings and preliminary studies of the data for Tennessee River at Chattanooga, Tenn., Florence, Ala., and Johnsonville, Tenn., were made by A. H. Horton, R. H. Bolster, and H. J. Jackson. The special estimates and studies of the completed data were made by H. J. Jackson, who also prepared the data for publication.

The computations were made by M. I. Walters, B. J. Peterson, J. H. Morgan, and E. D. Burchard.

The manuscript for this report was completed April 30, 1914, and use made of all records available up to that date, even though obtained subsequent to September 30, 1913. Some data, especially for the Tennessee River stations, were added after April 30, 1914, while the report was in proof.

The report was edited by Mrs. B. D. Wood.

STATION RECORDS.

ALLEGHENY RIVER BASIN.

ALLEGHENY RIVER AT RED HOUSE, N. Y.

Location.—At highway bridge at Red House, N. Y., on the road leading from the Pennsylvania Railroad station to the Erie Railroad station; about 5 miles below Salamanca and 13 miles above the State line between New York and Pennsylvania. Conewango Creek, the outlet of Chautauqua Lake, enters the Allegheny in the State of Pennsylvania.

Records available.—September 4, 1903, to September 30, 1913.

Drainage area.—1,640 square miles.

Gage.—Standard chain attached to the upstream side of bridge near left-hand end; gage read once daily at noon to half-tenths. Limits of use: Half-tenths below and tenths above 5.0.

Control.—Practically permanent since station was established. Current broken by three bridge piers, good for medium and high stages, and rather slow at low stages. Bed of stream at measuring section composed of coarse gravel.

Discharge measurements.—Made from downstream side of bridge.

Floods.—The flood of March 25–30, 1913, reached a gage height of 12.7 feet on March 26, as recorded by the observer and later verified from high-water marks by engineers of the Geological Survey. The corresponding discharge was approximately 40,000 second-feet, or 24.4 second-feet per square mile of drainage area.

Winter flow.—Affected by ice for short periods. Effect negligible during the very mild winter of 1912–13.

Regulation.—Low-water flow may be slightly affected by the operation of several small power plants above Salamanca. At Olean, N. Y., a wasteway from Cuba reservoir enters the river through Olean Creek. This reservoir is on the divide between Oil Creek, tributary to Allegheny River, and Genesee River, tributary to Lake Ontario. The stored water is commonly turned into Genesee River through the abandoned summit level of Genesee River canal, but may be diverted into Oil Creek through a guard lock at the head of the canal.

Accuracy.—Records fairly good.

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Discharge measurements of Allegheny River at Red House, N. Y., in the year ending Sept. 30, 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
1912.		*Feet.*	*Sec.-ft.*	1913.		*Feet.*	*Sec.-ft.*
Dec. 6	C. S. De Golyer	6.67	6,670	Mar. 29	C. S. De Golyer	11.27	27,700
6	do	6.72	7,190	May 1	do	7.96	11,500
				1	do	7.72	10,400
1913.				Aug. 12	G. H. Canfield	3.25	358
an. 21	do	8.35	13,300	12	do	3.22	341

Daily gage height, in feet, of Allegheny River at Red House, N. Y., for the year ending Sept. 30, 1913.

[W. E. Coe, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4.7	4.4	4.45	4.6	4.8	5.4	7.2	7.8	4.45	3.3	3.1	3.0
2	5.0	4.5	4.8	4.8	4.6	5.0	6.5	7.3	4.6	3.35	3.1	3.0
3	5.8	4.4	6.9	5.0	4.4	4.7	6.1	6.6	4.0	3.4	3.15	3.05
4	5.4	4.4	6.85	5.8	4.4	4.6	6.0	5.4	4.25	3.3	3.05	3.0
5	5.0	4.35	5.8	6.0	4.15	5.0	6.6	5.2	4.2	3.3	3.05	3.15
6	4.0	4.45	6.7	5.8	4.2	5.0	6.0	5.2	4.25	3.2	3.25	3.1
7	3.9	5.2	6.2	7.7	4.0	5.2	5.9	5.7	4.4	3.2	3.3	3.2
8	3.95	5.8	6.2	10.2	4.0	5.0	5.6	5.4	4.2	3.55	3.3	3.25
9	3.9	5.8	5.6	10.3	3.85	5.2	5.4	5.2	4.15	3.45	3.25	3.1
10	3.8	5.5	5.1	10.0	3.9	5.2	5.6	4.9	4.0	3.4	3.1	3.15
11	4.1	5.5	5.2	9.6	3.8	5.8	5.6	4.95	3.75	3.35	3.1	3.0
12	4.2	5.5	5.4	9.6	3.8	6.4	5.6	4.85	3.75	3.4	3.1	3.0
13	3.8	5.6	5.5	9.0	3.7	6.0	5.3	4.9	3.65	3.3	3.05	3.0
14	3.9	5.9	5.4	7.7	3.65	6.6	5.2	4.35	3.6	3.3	3.1	3.1
15	3.8	5.8	4.8	7.0	3.7	6.9	5.2	4.15	3.65	3.4	3.05	3.1
16	3.8	5.5	4.4	6.7	3.9	6.4	5.0	3.9	3.7	3.3	3.05	3.1
17	3.65	5.2	4.4	7.9	3.7	5.9	4.9	3.8	3.5	3.65	3.2	3.1
18	3.6	5.2	4.25	9.1	3.85	5.6	4.7	3.75	3.65	3.55	3.2	3.1
19	3.6	4.8	4.2	8.8	4.25	5.3	4.75	3.55	3.65	3.35	3.35	3.05
20	3.6	4.2	4.1	7.8	5.4	5.2	4.5	3.75	3.55	3.45	3.2	3.1
21	3.65	4.2	4.0	8.3	5.4	5.0	4.3	3.65	3.6	3.35	3.2	3.0
22	3.6	4.0	4.1	7.9	5.6	4.8	4.25	3.55	3.55	3.3	3.1	3.1
23	4.3	4.0	4.0	7.1	5.6	6.2	4.2	3.65	3.35	3.3	3.1	3.1
24	6.2	4.2	4.2	8.2	5.2	8.8	4.2	3.65	3.45	3.3	3.0	3.0
25	5.8	4.0	4.1	7.6	5.0	10.8	4.5	3.55	3.45	3.2	3.05	3.0
26	5.7	3.95	4.0	7.2	5.4	12.7	6.6	3.6	3.35	3.3	3.0	2.95
27	5.4	3.9	4.2	6.6	4.2	12.6	6.8	4.0	3.35	3.25	3.0	2.95
28	5.0	3.95	4.6	6.0	5.0	12.2	9.6	6.7	3.45	3.25	3.0	3.0
29	4.8	3.9	4.6	5.6	.....	11.0	10.2	6.8	3.2	3.2	3.1	3.0
30	4.6	3.9	4.55	5.2	.....	9.6	9.0	6.5	3.0	3.35	3.1	3.0
31	4.5	.....	4.55	5.2	.....	8.7	.....	4.85	.....	3.25	3.0	.....

NOTE.—Discharge relation not affected by ice.

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Daily discharge, in second-feet, of Allegheny River at Red House, N. Y., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,320	1,850	1,920	2,160	2,490	3,690	8,750	10,800	1,820	410	260	200
2	2,860	2,000	2,490	2,490	2,160	2,860	6,480	9,100	2,070	455	260	200
3	4,610	1,850	7,720	2,860	1,850	2,320	5,360	6,780	1,170	500	295	230
4	3,690	1,850	7,560	4,610	1,850	2,160	5,090	3,630	1,520	410	230	200
5	2,860	1,780	4,610	5,100	1,500	2,860	6,780	3,200	1,440	410	230	295
6	1,300	1,920	7,080	4,610	1,570	2,860	5,090	3,200	1,520	330	370	260
7	1,180	3,260	5,630	10,500	1,300	3,260	4,830	4,320	1,740	330	410	330
8	1,240	4,610	5,630	21,800	1,300	2,860	4,080	3,630	1,440	650	410	370
9	1,180	4,610	4,140	22,400	1,120	3,260	3,630	3,200	1,370	550	370	260
10	1,060	3,910	3,060	20,800	1,180	3,260	4,080	2,610	1,170	500	260	295
11	1,440	3,910	3,260	18,800	1,060	4,610	4,080	2,700	865	455	260	200
12	1,570	3,910	3,690	18,800	1,060	6,190	4,080	2,520	865	500	260	200
13	1,060	4,140	3,910	15,900	940	5,100	3,410	2,610	755	410	230	200
14	1,180	4,850	3,690	10,500	884	6,780	3,200	1,660	700	410	260	260
15	1,060	4,610	2,490	8,050	940	7,720	3,200	1,370	755	500	230	260
16	1,060	3,910	1,850	7,080	1,180	6,190	2,800	1,040	810	410	230	260
17	884	3,260	1,850	11,200	940	4,860	2,610	920	690	755	330	260
18	828	3,260	1,640	16,400	1,120	4,140	2,240	865	755	650	330	260
19	828	2,490	1,570	15,000	1,640	3,470	2,330	650	755	455	455	230
20	828	1,570	1,440	10,800	3,690	3,260	1,900	865	650	550	330	260
21	884	1,570	1,300	12,800	3,690	2,860	1,590	755	700	455	330	200
22	828	1,300	1,440	11,200	4,140	2,490	1,520	650	650	410	260	260
23	1,710	1,300	1,300	8,400	4,140	5,630	1,440	755	455	410	260	260
24	5,630	1,570	1,570	12,400	3,260	15,000	1,440	755	550	410	200	200
25	4,610	1,300	1,440	10,200	2,860	25,100	1,900	650	550	330	230	200
26	4,370	1,240	1,300	8,750	3,690	a36,000	6,780	700	455	410	200	175
27	3,690	1,180	1,570	6,780	1,570	35,400	7,390	1,170	455	370	200	175
28	2,860	1,240	2,160	5,100	2,860	33,000	18,800	7,080	550	370	200	200
29	2,490	1,180	2,160	4,140	.....	26,200	21,800	7,390	330	330	260	200
30	2,160	1,180	2,080	3,260	.....	18,800	15,900	6,480	200	455	260	200
31	2,000	.....	2,080	3,260	.....	14,600	.....	2,520	.....	370	200	.....

a See "Floods" in station description.

NOTE.—Daily discharge computed from a well-defined rating curve. A new rating curve used beginning Mar. 27, 1913, which differs from the former curve only below gage height 6.1 feet.

Monthly discharge of Allegheny River at Red House, N. Y., for the year ending Sept. 30, 1913.

[Drainage area, 1,640 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	5,630	828	2,070	1.26	1.45	A.
November	4,850	1,180	2,550	1.55	1.73	A.
December	7,720	1,300	3,020	1.84	2.12	A.
January	22,400	2,160	10,200	6.22	7.17	B.
February	4,140	884	2,000	1.22	1.27	B.
March	36,000	2,160	9,570	5.84	6.73	A.
April	21,800	1,440	5,420	3.30	3.68	A.
May	10,800	650	3,050	1.86	2.14	B.
June	2,070	200	922	.562	.63	B.
July	755	330	450	.274	.32	B.
August	455	200	278	.170	.20	C.
September	370	175	237	.145	.16	C.
The year	36,000	175	3,340	2.04	27.60	

ALLEGHENY RIVER AT KITTANNING, PA.

Location.—At the Market Street Bridge, in the city of Kittanning, Pa., about 4 miles above the mouth of Crooked River and more than 12 miles above the mouth of Kiskiminitas River.

Records available.—August 18, 1904, to September 30, 1913.

Drainage area.—9,010 square miles.

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Gage.—Chain gage attached to bridge; gage read once daily in the afternoon to half-tenths.

Control.—Probably permanent.

Discharge measurements.—Made from downstream side of bridge.

Winter flow.—Ice may affect the discharge relation for short periods during December, January, and February.

Accuracy.—Conditions of flow practically constant; low and medium stage rating curve excellent; numerous measurements at high stages. A marked difference exists between the discharge at a given high gage height for rising and for falling stage, due to increase and decrease of slope; the difference at times amounts to as much as 15 per cent, and as the variation differs for each flood it is difficult to determine accurately the daily discharge at high stages.

Cooperation.—Station now maintained by the Water Supply Commission of Pennsylvania, which has furnished all records for year ending September 30, 1913.

Discharge measurements of Allegheny River at Kittanning, Pa., in the year ending Sept. 30, 1913.

Date.	Hydrographer.	Gage height.	Discharge.
1912.		*Feet.*	*Sec.-ft.*
Dec. 8	R. A. Boehringer [a]	9.93	34,400
1913.			
Aug. 22	.....do	1.56	1,010

[a] An engineer of the Water Supply Commission of Pennsylvania.

Daily gage height, in feet, of Allegheny River at Kittanning, Pa., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	5.25	6.55	4.60	8.70	7.90	10.60	12.30	10.90	6.10	4.60	2.05	1.55
2	5.10	5.80	6.10	7.80	7.20	9.80	10.80	10.15	5.75	4.10	2.00	1.50
3	4.85	5.40	5.80	7.50	6.60	9.10	9.40	9.30	5.40	3.90	1.95	1.50
4	4.60	5.15	8.80	8.80	6.15	7.80	8.85	8.20	5.10	3.60	1.95	1.45
5	4.40	4.90	9.25	8.20	5.50	7.10	8.30	7.40	4.80	3.35	1.90	1.45
6	4.10	4.60	9.10	9.50	4.80	6.45	7.95	6.60	4.55	3.15	1.85	1.40
7	3.90	5.80	8.20	14.55	4.65	5.80	7.60	5.95	4.30	2.95	1.80	1.35
8	3.70	6.60	7.45	21.35	4.70	5.20	7.25	5.20	4.05	2.85	1.75	1.30
9	3.45	7.90	7.40	[c]22.54	4.75	5.10	6.90	4.85	3.90	2.70	1.75	1.27
10	3.20	8.60	7.30	17.40	4.90	6.30	6.70	4.55	3.60	2.60	1.80	1.25
11	3.30	8.90	6.90	17.10	5.00	7.70	7.20	4.20	3.35	3.50	1.90	1.20
12	3.90	8.00	6.40	18.00	5.05	9.60	7.05	3.95	3.20	5.10	2.10	1.18
13	4.30	7.30	5.95	15.60	5.20	13.05	6.90	4.40	3.20	5.25	2.05	1.15
14	4.20	6.50	5.60	13.90	5.10	12.10	7.80	4.45	3.15	5.05	2.00	1.15
15	4.05	6.10	5.25	12.40	4.95	10.90	7.50	4.20	3.05	4.50	1.95	1.10
16	3.90	6.90	5.05	12.80	4.80	9.60	7.15	3.90	2.90	3.70	1.90	1.10
17	4.20	6.40	5.40	13.10	4.70	8.90	6.80	3.65	2.75	3.20	1.85	1.10
18	4.60	5.70	5.80	11.90	4.65	8.20	6.55	3.40	2.55	2.80	1.85	1.20
19	4.25	5.20	5.60	11.00	4.55	7.75	6.10	3.20	2.70	2.60	2.30	1.40
20	4.10	4.90	5.25	16.00	4.45	7.40	5.65	3.70	3.40	2.45	2.40	1.55
21	4.80	4.70	4.85	14.40	4.40	7.10	5.30	3.85	3.55	2.20	2.30	1.80
22	5.40	4.45	4.50	14.60	6.45	6.90	5.10	3.75	3.45	2.05	1.88	2.05
23	6.30	4.20	4.30	13.10	11.20	7.05	4.90	3.50	4.80	2.00	2.25	2.15
24	8.10	3.95	4.20	13.50	9.05	7.20	4.70	3.30	6.10	1.95	1.88	2.60
25	12.10	3.80	4.05	12.55	8.60	20.05	4.60	3.10	6.90	1.90	2.10	2.75
26	13.60	3.70	3.90	11.60	9.75	[b]29.55	5.05	4.60	7.00	1.85	2.00	2.70
27	12.05	3.55	3.80	11.10	11.80	29.15	6.20	6.10	6.50	1.85	1.90	2.60
28	10.20	3.45	4.00	9.60	12.25	24.55	8.10	6.95	6.15	1.80	1.85	2.50
29	9.00	3.30	4.30	9.80	.....	18.95	9.90	7.10	5.70	1.95	1.80	2.60
30	8.10	3.20	5.40	9.20	.....	16.48	11.45	6.90	5.15	2.10	1.70	2.50
31	7.40	.....	9.60	8.50	.....	14.10	.....	6.40	.....	2.10	1.60	.....

[a] Maximum, 25.3 feet at 1 a. m.; discharge, 194,000 second-feet.
[b] Maximum, 30.7 feet, at 4 p. m.; discharge, 269,000 second-feet.

NOTE.—No ice reported. Discharge relation probably not affected by ice.

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Daily discharge, in second-feet, of Allegheny River at Kittanning, Pa., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	10,300	16,500	7,600	29,700	24,500	42,900	55,300	45,000	14,300	7,600	1,680	1,040
2	9,640	12,800	14,300	23,900	20,200	37,200	44,300	29,700	12,600	6,100	1,600	990
3	8,580	11,000	12,800	22,000	16,800	32,400	34,400	33,700	11,000	5,580	1,540	990
4	7,600	9,860	30,400	30,300	14,500	23,900	30,700	26,400	9,640	4,850	1,540	935
5	6,960	8,780	33,400	26,400	11,400	19,600	27,100	21,400	8,380	4,280	1,460	935
6	6,100	7,600	32,400	35,100	8,380	16,000	24,800	16,800	7,430	3,830	1,400	880
7	5,580	12,800	26,400	73,900	7,790	12,800	22,600	13,600	6,660	3,380	1,340	828
8	5,080	16,800	21,700	144,000	7,980	10,100	20,500	10,100	5,970	3,160	1,280	775
9	4,500	24,500	21,400	159,000	8,180	9,640	18,400	8,580	5,580	2,850	1,280	744
10	3,940	29,000	20,800	101,000	8,770	15,300	17,300	7,430	4,850	2,640	1,340	722
11	4,160	31,000	18,400	97,600	9,200	23,300	20,200	6,380	4,280	4,620	1,460	670
12	5,580	25,200	15,800	107,000	9,420	35,800	19,300	5,710	3,940	9,640	1,760	650
13	6,660	20,800	13,600	83,300	10,100	61,200	18,400	6,960	3,940	10,300	1,680	620
14	6,380	16,200	11,900	68,200	9,630	53,800	23,900	7,110	3,830	9,420	1,600	620
15	5,970	14,300	10,300	56,100	8,960	45,000	22,000	6,380	3,600	7,260	1,540	570
16	5,580	18,400	9,420	59,200	8,380	35,800	19,900	5,580	3,270	5,080	1,460	570
17	6,380	15,800	11,000	61,600	7,980	31,000	17,800	4,960	2,960	3,940	1,400	570
18	7,600	12,400	12,800	52,300	7,790	26,400	16,500	4,390	2,540	3,060	1,400	670
19	6,520	10,100	11,900	45,700	7,430	23,600	14,300	3,940	2,850	2,640	2,080	880
20	6,100	8,780	10,300	87,000	7,110	21,400	12,100	5,080	4,390	2,350	2,260	1,040
21	8,380	7,980	8,580	72,600	6,950	19,600	10,500	5,460	4,740	1,920	2,080	1,340
22	11,000	7,110	7,260	74,400	16,000	18,400	9,640	5,200	4,500	1,680	1,440	1,680
23	15,300	6,380	6,660	61,600	47,100	19,300	8,780	4,620	8,380	1,600	2,000	1,840
24	25,800	5,710	6,380	64,900	32,000	20,200	7,980	4,160	14,300	1,540	1,440	2,640
25	53,800	5,340	5,970	57,200	29,000	129,000	7,600	3,720	18,400	1,460	1,760	2,960
26	65,700	5,080	5,580	50,000	36,800	263,000	9,420	7,600	19,000	1,400	1,600	2,850
27	53,400	4,740	5,340	46,400	51,500	247,000	14,800	14,300	16,200	1,400	1,460	2,640
28	40,000	4,500	5,840	35,800	54,900	184,000	25,800	18,700	14,500	1,340	1,400	2,440
29	31,700	4,160	6,660	37,200	.....	117,000	37,900	19,600	12,400	1,540	1,340	2,640
30	25,800	3,940	11,000	33,000	.....	91,500	49,000	18,400	9,860	1,760	1,220	2,440
31	21,400	.....	35,800	28,400	.....	70,000	.....	15,800	.....	1,760	1,100	.....

Monthly discharge of Allegheny River at Kittanning, Pa., for the year ending Sept 30, 1913.

[Drainage area, 9,010 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.a	Minimum.	Mean.	Per square mile.	
October	65,700	3,940	15,500	1.72	1.98
November	31,000	3,940	12,600	1.40	1.56
December	35,800	5,340	14,600	1.62	1.87
January	194,000	22,000	62,100	6.89	7.94
February	54,900	6,950	17,500	1.94	2.02
March	269,000	9,640	56,300	6.25	7.21
April	55,300	7,600	22,000	2.44	2.72
May	45,000	3,720	12,800	1.42	1.64
June	19,000	2,540	8,140	.903	1.01
July	10,300	1,340	3,870	.430	.50
August	2,260	1,100	1,560	.173	.20
September	2,960	570	1,310	.145	.16
The year	269,000	570	19,100	2.12	28.81

a Crest discharge where available. See footnotes to table of daily gage height.

NOTE.—Estimates of monthly discharge were computed according to rules of the U. S. Geological Survey and differ slightly from those published by the Water-Supply Commission of Pennsylvania.

KISKIMINITAS RIVER AT AVONMORE, PA.

Location.—At the highway bridge near Avonmore station on the Pennsylvania Railroad, about 4 miles below the mouth of Blacklegs Creek, about 1 mile above the mouth of Long Run, and about 5 miles below the junction of Conemaugh River with Loyalhanna Creek to form the Kiskiminitas.

Records available.—June 11, 1907, to September 30, 1913.

Drainage area.—1,720 square miles.

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Gage.—Chain attached to bridge; read daily morning and evening to half-tenths.
Control.—Probably permanent.
Discharge measurements.—Made from downstream side of bridge.
Floods.—Flood of March 19, 1908, reached a height of 30.8 feet on the gage; discharge estimated at 80,500 second-feet, or about 47 second-feet per square mile from 1,720 square miles of drainage area.
Winter flow.—Ice may affect the discharge relation for short periods during December, January, and February.
Accuracy.—New rating curve, based on 4 discharge measurements made during 1912 and 1913, and on 5 measurements made in 1914, used beginning January 1, 1913; discharge measurement made December 6, 1912, indicates that new curve is probably applicable also to 1912. Persons using records should give due weight to this probability. Last measurement prior to 1912 made March 2, 1910.
Cooperation.—Station now maintained by the Water-Supply Commission of Pennsylvania, which furnished all records for the year ending September 30, 1913.

Discharge measurements of Kiskiminitas River at Avonmore, Pa., in the year ending Sept. 30, 1913.

Date.	Hydrographer.	Gage height.	Discharge.
1912.		*Feet.*	*Sec.-ft.*
Dec. 6	R. A. Boehringer	6.43	3,310
1913.			
Jan. 9	Boehringer and Hinkley	17.53	26,900
9	....do	17.00	25,600
Aug. 16	R. A. Boehringer	2.58	359

Daily gage height, in feet, of Kiskiminitas River at Avonmore, Pa., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	6.02	4.92	3.38	7.93	5.71	8.95	6.91	5.16	6.92	3.04	2.97	2.40
2	5.35	4.80	3.30	6.89	5.03	7.96	6.15	4.78	6.00	2.94	2.92	2.40
3	4.92	4.55	3.68	8.46	4.86	6.41	5.89	4.52	5.47	2.87	2.77	2.40
4	4.65	4.24	4.30	11.23	5.76	6.50	6.07	4.34	5.00	2.92	2.62	2.40
5	4.22	3.96	3.80	8.79	6.83	6.61	5.53	4.12	4.60	2.82	2.57	2.35
6	4.05	3.92	5.94	8.66	[a] 8.83	6.11	5.26	4.00	4.27	4.42	2.54	2.30
7	3.78	4.70	7.00	14.39	7.86	5.19	4.86	3.92	4.12	3.57	2.62	2.30
8	3.70	8.66	5.95	[b] 20.21	7.72	4.76	4.69	3.84	4.22	3.14	3.12	3.95
9	3.61	6.96	5.30	16.61	7.81	5.53	4.46	3.70	3.92	3.12	2.90	3.88
10	3.92	6.20	4.62	11.21	7.73	5.86	4.29	3.54	3.64	3.44	2.74	3.05
11	5.50	5.70	4.75	11.59	7.66	6.71	4.29	3.40	3.50	3.67	2.74	2.75
12	4.45	5.20	4.42	18.43	8.06	7.57	4.93	3.32	3.37	3.22	2.92	2.62
13	3.90	4.98	3.62	13.96	7.31	6.72	5.01	3.27	3.30	2.92	2.84	2.58
14	3.60	4.95	3.65	10.53	6.79	7.12	5.09	3.24	3.22	2.82	2.70	2.50
15	3.40	5.25	4.06	8.73	6.83	7.93	5.37	3.30	3.16	2.87	2.63	2.45
16	3.39	4.70	4.02	8.30	6.89	7.21	5.89	4.54	3.02	3.00	2.60	2.35
17	3.30	5.02	4.00	9.75	6.79	6.40	5.70	4.54	2.97	2.84	2.57	2.45
18	3.25	4.25	3.85	10.35	6.56	5.81	5.16	4.04	3.04	3.24	2.57	2.60
19	3.42	4.16	4.08	10.13	6.49	5.47	4.85	3.68	2.97	3.37	2.74	2.72
20	3.52	3.94	4.42	8.83	6.73	5.29	4.56	3.50	3.00	3.02	2.62	2.72
21	3.72	3.98	4.02	9.15	7.10	5.29	4.30	3.36	3.27	2.82	2.60	3.05
22	3.44	3.86	3.70	8.42	[a] 9.49	5.16	4.15	3.45	3.44	2.74	2.50	3.95
23	5.80	3.76	3.40	8.70	7.71	4.86	4.08	4.84	3.27	2.77	3.04	4.02
24	8.46	3.74	3.55	11.46	6.16	4.61	3.97	8.68	3.02	2.72	2.80	3.35
25	9.54	3.60	3.74	9.79	4.86	4.66	3.83	7.14	3.27	2.77	2.70	3.05
26	[c] 10.60	3.68	3.70	8.30	4.90	9.01	3.75	6.07	3.30	2.82	2.60	2.82
27	8.55	3.58	3.60	7.51	5.75	[d] 15.16	3.85	[e] 14.27	4.22	2.76	2.54	2.73
28	7.20	3.51	4.22	7.01	10.26	12.87	4.83	13.47	4.27	2.62	2.52	2.62
29	6.25	3.40	4.09	6.55	.....	9.59	5.96	10.24	3.72	3.02	2.52	2.58
30	5.65	3.15	4.75	6.15	.....	8.06	5.91	8.20	3.34	3.32	2.44	2.55
31	5.22	.....	9.82	6.01	.....	7.21	.....	7.96	.....	3.17	2.42	.....

[a] River frozen over, Feb. 6–22.
[b] Maximum, 22.21 feet, at 4.45 p. m.; discharge, 44,700 second-feet.
[c] Maximum, 11 feet, at 8.30 a. m.; discharge, 12,200 second-feet.
[d] Maximum, 16.11 feet, at 4.45 p. m.; discharge, 24,000 second-feet.
[e] Maximum, 18.47 feet, at 4.45 p. m.; discharge, 31,300 second-feet.

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Daily discharge, in second-feet, of Kiskiminitas River at Avonmore, Pa., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3,710	2,350	956	5,860	3,040	7,380	4,500	2,420	4,520	626	582	285
2	2,860	2,220	900	4,480	2,280	5,900	3,560	2,030	3,380	564	552	285
3	2,350	1,960	1,190	6,650	2,110	3,880	3,250	1,790	2,770	522	464	285
4	2,060	1,670	1,720	11,600	3,100	3,990	3,460	1,630	2,250	552	385	285
5	1,650	1,430	1,290	7,140	4,400	4,130	2,830	1,430	1,860	492	362	265
6	1,500	1,390	3,600	6,950	.....	3,510	2,530	1,320	1,560	1,700	348	245
7	1,270	2,110	5,000	19,200	.....	2,450	2,110	1,260	1,430	994	385	245
8	1,200	7,590	3,620	37,400	.....	2,010	1,950	1,200	1,520	693	679	1,280
9	1,130	4,950	2,800	25,500	.....	2,830	1,730	1,090	1,260	679	540	1,230
10	1,390	3,940	2,030	11,600	.....	3,210	1,580	973	1,040	903	447	632
11	3,040	3,300	2,160	12,400	.....	4,250	1,580	875	945	1,070	447	452
12	1,860	2,680	1,830	31,200	.....	5,360	2,180	819	854	749	552	385
13	1,380	2,420	1,140	18,100	.....	4,260	2,260	784	805	552	504	366
14	1,120	2,390	1,160	10,200	.....	4,780	2,340	763	749	492	425	330
15	970	2,740	1,510	7,060	.....	5,860	2,650	805	707	522	390	308
16	963	2,110	1,480	6,410	.....	4,890	3,250	1,810	613	600	375	265
17	900	2,470	1,460	8,720	.....	3,860	3,030	1,810	582	504	362	308
18	858	1,680	1,330	9,840	.....	3,160	2,420	1,360	626	763	362	375
19	985	1,600	1,530	9,420	.....	2,770	2,100	1,080	582	854	447	436
20	1,060	1,410	1,830	7,300	.....	2,560	1,820	945	600	613	385	436
21	1,220	1,440	1,480	7,700	.....	2,560	1,590	847	784	492	375	632
22	1,000	1,340	1,200	6,590	.....	2,420	1,460	910	903	447	330	1,290
23	3,420	1,260	970	7,010	5,550	2,110	1,380	2,090	784	464	626	1,340
24	7,250	1,240	1,080	12,100	3,570	1,870	1,300	6,980	613	436	480	840
25	9,160	1,120	1,240	8,780	2,110	1,920	1,190	4,800	784	464	425	632
26	11,300	1,190	1,200	6,410	2,150	7,480	1,130	3,460	805	492	375	492
27	7,400	1,110	1,120	5,280	3,090	21,200	1,200	18,900	1,520	458	348	436
28	5,280	1,050	1,650	4,830	9,660	15,400	2,080	16,900	1,560	385	339	385
29	4,000	970	1,540	4,050	.....	8,440	3,330	9,630	1,100	613	339	366
30	3,230	802	2,160	3,560	.....	6,050	3,270	6,260	833	819	303	352
31	2,700	.....	9,700	3,390	.....	4,890	.....	5,900	.....	714	294	.....

NOTE.—Discharge Feb. 6–22, 1913, estimated because of ice as follows: Feb. 6–22, 1,640 second-feet. See "Accuracy" in station description.

Monthly discharge of Kiskiminitas River at Avonmore, Pa., for the year ending Sept. 30, 1915.

[Drainage area, 1,720 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.[a]	Minimum.	Mean.	Per square mile.	
October	12,200	868	2,850	1.66	1.91
November	7,590	802	2,130	1.24	1.38
December	9,700	900	2,000	1.16	1.34
January	44,700	3,390	10,500	6.10	7.03
February	9,660	.....	2,460	1.43	1.49
March	24,000	1,870	5,010	2.91	3.36
April	4,500	1,130	2,300	1.34	1.50
May	31,300	763	3,320	1.93	2.22
June	4,520	582	1,280	.744	.83
July	1,700	385	653	.380	.44
August	679	294	427	.248	.29
September	1,340	245	515	.299	.33
The year	44,700	245	2,810	1.63	22.12

[a] Crest discharge where available.

NOTE.—See "Accuracy" in station description and footnotes to table of daily gage heights.

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BLACKLICK CREEK AT BLACKLICK, PA.

Location.—At highway bridge, about one-fourth mile from the railroad station a Blacklick, Pa., about 1 mile below the junction of Blacklick and Two Lick creek and about 6 miles above the junction of Blacklick Creek with Conemaugh River

Records available.—August 16, 1904, to July 15, 1906; January 8, 1907, to Septem ber 30, 1913.

Drainage area.—386 square miles.

Gage.—Chain attached to bridge read daily, morning and evening, to hundredths.

Control.—Fairly permanent.

Discharge measurements.—At high and medium stages made from upstream side of highway bridge; at low stages made by wading at section just above the bridge. Extreme high-water measurements made from the coal tipple one-fourth mile above the bridge.

Winter flow.—Ice may affect the discharge relation for short periods during December, January, and February.

Accuracy.—Changes in rating curves necessitated by the reconstruction of the highway bridge were discussed in Water-Supply Paper 263, page 43. Rating curve used for year ending September 30, 1913, differs above 1,800 second-feet from that used prior to 1912 as a result of discharge measurements made during 1912 and 1913.

Cooperation.—Since January 8, 1907, station has been maintained by the Water Supply Commission of Pennsylvania, which supplied all records for the year ending September 30, 1913.

Discharge measurements of Blacklick Creek at Blacklick, Pa., in the year ending Sept. 30, 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge
1912.		*Feet.*	*Sec.-ft.*	1913.		*Feet.*	*Sec.-ft.*
Dec. 6	R. A. Boehringer.....	5.30	2,372	Jan. 9	—— Reckord.....	6.72	4,976
				9	.....do.....	6.39	4,255
1913.				12	.....do.....	8.60	9,153
Jan. 9	—— Reckord.....	7.01	5,442	Aug. 16	R. A. Boehringer.....	2.16	37

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Daily gage height, in feet, of Blacklick Creek at Blacklick, Pa., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3.48	3.48	2.68	4.50	3.81	4.90	4.00	3.63	4.02	2.50	2.26	2.08
2	3.26	3.44	2.82	4.03	3.38	4.56	3.74	3.37	3.72	2.46	2.22	2.05
3	3.16	3.28	3.53	6.21	3.48	4.20	3.66	3.23	3.45	2.42	2.17	2.07
4	3.06	3.14	3.18	6.14	3.40	3.95	3.50	3.12	3.29	2.38	2.14	2.03
5	2.96	3.04	3.04	5.85	3.17	4.16	3.40	3.05	4.15	2.50	2.12	2.01
6	2.87	2.96	4.96	5.53	3.23	3.87	3.29	2.97	3.05	2.52	2.08	2.03
7	2.78	3.58	4.88	7.51	3.22	3.32	3.20	3.01	2.97	2.42	3.49	2.09
8	2.69	4.14	4.11	[a]9.31	3.24	3.36	3.10	2.88	2.98	2.34	3.30	2.30
9	3.16	3.69	3.72	6.68	3.18	3.61	3.02	2.80	2.83	2.36	2.96	2.27
10	3.24	3.60	3.44	5.32	3.07	3.86	2.97	2.75	2.69	2.41	2.57	2.17
11	2.92	3.53	3.68	7.35	3.08	4.44	3.06	2.70	2.58	2.48	2.50	2.18
12	2.80	3.46	3.83	8.78	3.10	4.24	3.41	2.67	2.57	2.38	2.41	2.10
13	2.74	3.41	[b]3.78	6.40	3.05	4.05	3.24	2.63	2.57	2.32	2.32	2.07
14	2.72	3.40	3.51	5.16	3.13	4.58	3.27	2.59	2.52	2.31	2.27	2.05
15	2.70	3.31	3.16	4.56	3.04	4.49	3.33	2.68	2.49	2.32	2.22	2.05
16	2.62	3.20	3.14	4.60	2.92	4.15	3.30	3.21	2.45	2.28	2.16	2.05
17	2.60	3.10	3.10	5.92	2.87	3.84	3.17	3.26	2.41	2.28	2.16	2.14
18	2.58	3.04	3.16	5.82	2.81	3.60	3.06	2.97	2.29	2.75	2.30	2.25
19	2.82	3.00	3.28	5.40	2.85	3.55	3.04	2.87	2.11	2.50	2.29	2.29
20	3.08	2.98	3.16	4.83	3.12	3.48	2.96	2.84	2.51	2.34	2.22	2.23
21	2.84	2.94	3.18	5.10	3.53	3.44	2.87	2.79	2.68	2.27	2.18	2.51
22	2.72	2.88	3.19	4.70	4.71	3.35	2.82	2.45	2.64	2.20	2.16	2.73
23	5.89	2.83	3.08	5.32	4.80	3.20	2.83	4.67	2.50	2.11	2.17	2.52
24	5.31	2.80	2.92	6.08	3.78	3.18	2.78	3.90	2.45	2.18	2.15	2.35
25	[c]6.60	2.82	[d]2.86	5.14	3.51	3.24	2.76	3.74	2.47	2.43	2.13	2.25
26	6.20	2.79	2.80	4.62	3.36	5.64	2.76	3.85	2.49	2.39	2.13	2.23
27	5.04	2.76	2.92	4.26	4.12	[e]8.13	3.34	[f]9.76	3.39	2.26	2.08	2.15
28	4.45	2.73	2.91	3.96	5.97	6.20	3.65	6.67	2.95	2.30	2.06	2.13
29	4.06	2.66	2.75	3.74	.....	5.07	4.28	5.25	2.91	2.70	2.07	2.09
30	3.78	2.66	3.76	3.58	.....	4.52	3.80	4.61	2.71	2.72	2.15	2.07
31	3.56	.....	5.38	3.64	.....	4.22	.....	4.57	.....	2.39	2.13	.....

[a] Maximum, 10.5 feet, at 3 p. m.; discharge, 13,500 second-feet.
[b] Creek frozen across.
[c] Maximum, 7.10 feet, at 6 p. m.; discharge, 5,690 second-feet.
[d] Ice all out of creek.
[e] Maximum, 8.7 feet, at 2 p. m.; discharge, 9,100 second-feet.
[f] Maximum, 10.41 feet, at 11 a. m.; discharge, 13,300 second-feet.

NOTE.—Discharge relation probably not materially affected by ice.

Daily discharge, in second-feet of Blacklick Creek at Blacklick, Pa., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	577	577	198	1,420	813	1,840	965	681	962	140	73	35
2	448	551	248	990	514	1,480	760	508	745	128	64	30
3	395	459	611	3,890	577	1,140	702	432	558	116	53	33
4	347	385	405	3,760	525	925	590	375	464	105	46	26
5	304	338	338	3,250	400	1,100	525	342	390	140	42	23
6	368	312	1,940	2,730	432	861	464	308	342	146	35	26
7	333	646	1,820	6,550	426	481	415	325	308	116	584	36
8	302	1,090	1,060	11,700	437	503	365	272	312	94	470	83
9	395	723	745	4,820	405	667	329	240	252	99	304	76
10	437	660	551	2,400	352	853	308	222	202	113	162	53
11	288	611	716	6,220	356	1,360	347	205	166	134	140	44
12	240	564	829	9,280	365	1,180	532	195	162	105	113	38
13	219	532	790	4,260	342	1,010	437	182	162	88	88	33
14	212	525	597	2,170	380	1,500	454	169	146	86	76	30
15	205	476	395	1,480	338	1,410	486	198	137	88	64	30
16	179	415	385	1,520	288	1,100	470	420	125	78	51	30
17	172	365	365	3,370	288	837	400	448	113	78	51	46
18	166	338	395	3,200	244	660	347	308	81	222	83	71
19	248	320	459	2,520	260	625	338	268	40	140	81	81
20	356	312	395	1,760	375	577	304	256	143	94	64	66
21	256	296	405	2,090	611	551	268	236	198	76	55	143
22	212	272	410	1,620	1,630	498	248	558	185	59	51	216
23	3,220	252	356	2,400	1,730	415	252	1,590	140	40	53	146
24	2,390	240	288	3,650	790	405	233	885	125	55	48	96
25	4,660	248	264	2,150	597	492	226	760	131	119	44	71
26	3,880	226	240	1,540	503	2,900	226	845	137	107	44	66
27	2,010	226	288	1,190	1,070	7,850	492	11,600	520	73	35	48
28	1,370	216	284	949	3,460	3,875	695	4,800	300	83	31	44
29	1,020	192	222	760	.....	2,050	1,210	2,300	284	205	33	36
30	790	192	775	646	.....	1,440	805	1,530	208	212	48	33
31	632	.....	2,500	688	.....	1,160	.....	1,490	.....	107	44	.....

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Monthly discharge of Blacklick Creek at Blacklick, Pa., for the year ending Sept. 30, 1913.

[Drainage area, 386 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.a	Minimum.	Mean.	Per square mile.	
October	5,690	166	853	2.21	2.55
November	1,090	192	419	1.09	1.21
December	2,500	198	622	1.61	1.86
January	13,500	646	3,060	7.93	9.14
February	3,460	244	660	1.71	1.78
March	9,100	405	1,350	3.50	4.04
April	1,210	226	473	1.23	1.37
May	13,300	169	1,060	2.75	3.17
June	982	40	269	.697	.78
July	222	40	111	.288	.33
August	584	31	101	.262	.30
September	216	23	60	.155	.17
The year	13,500	23	759	1.97	26.70

a Crest discharge where available. See footnotes to table of daily gage height.

MONONGAHELA RIVER BASIN.

TYGART RIVER AT BELINGTON, W. VA.

Location.—At highway bridge at Belington, W. Va., one-fourth mile above the mouth of Mill Creek.

Records available.—June 5, 1907, to September 30, 1913.

Drainage area.—390 square miles.

Gage.—Standard chain gage attached to bridge; gage read daily in the morning to hundredths. Limits of use: Hundredths below 3.5, half tenths from 3.5 to 4.5, and tenths above 4.5. Sea-level elevation of the zero of the gage is 1,679.89 feet.

Control.—Practically permanent.

Discharge measurements.—Made from upstream side of the bridge.

Floods.—Flood of July, 1912, reached gage height 20.3 feet.

Point of zero flow.—Determination by leveling, August 22, 1910, indicated that there would be no flow past the gage if the river stage were to fall to about 1.6 feet, referred to the gage datum. On November 6, 1913, this stage was found to be 1.4 feet ±0.2 foot.

Winter flow.—Ice may affect the discharge relation for two or three weeks at a time during December, January, and February.

Accuracy.—Discharge rating curves poorly defined above 2,500 second-feet, being simply extensions; all discharge values above that point should be used with due regard for this fact.

The following discharge measurement was made by G. C. Stevens:

March 30, 1913: Gage height, 5.46 feet; discharge, 1,520 second-feet.

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Daily gage height, in feet, of Tygart River at Belington, W. Va., for the year ending Sept. 30, 1913.

[S. A. Campbell, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.99	2.50	2.64	6.7	4.6	4.35	4.45	5.1	6.5	2.60	3.41	2.50
2	2.90	2.53	2.51	5.0	4.3	4.25	4.05	5.0	5.1	2.46	3.04	2.40
3	2.82	2.53	2.80	4.3	4.5	4.2	3.95	4.1	4.45	2.44	2.98	2.40
4	2.72	2.53	2.81	6.8	7.4	4.0	3.8	3.85	4.0	2.58	2.75	2.42
5	2.54	2.52	3.20	6.2	6.9	3.9	3.75	3.65	3.95	3.45	2.63	2.40
6	2.51	2.49	4.1	5.6	5.5	3.75	3.7	3.5	3.65	3.55	2.55	2.40
7	2.48	2.64	4.8	9.6	4.6	3.6	3.65	3.42	3.5	3.43	2.48	2.30
8	2.48	6.7	4.0	10.2	4.05	3.49	3.55	3.36	3.9	3.25	2.44	2.50
9	2.44	5.6	3.85	10.8	3.95	3.6	3.5	3.28	4.3	2.96	2.40	3.00
10	2.40	4.6	3.65	7.0	3.9	3.7	3.49	3.10	4.2	6.4	2.38	2.81
11	2.35	3.7	3.40	5.5	3.7	4.5	3.41	3.04	3.85	10.4	2.36	2.62
12	2.35	4.45	3.27	9.0	4.45	6.7	3.48	3.00	3.5	5.5	2.61	2.45
13	2.30	3.28	3.27	8.4	4.5	5.6	3.46	2.96	3.31	4.9	4.0	2.41
14	2.27	3.20	3.20	6.2	4.8	5.5	3.42	2.88	3.09	4.3	10.6	2.35
15	2.26	3.22	2.91	6.1	4.45	8.3	3.48	3.34	3.02	6.5	4.7	2.30
16	2.23	3.15	2.88	4.6	4.0	6.8	9.7	3.65	2.91	5.1	3.75	2.30
17	2.23	3.06	2.90	4.9	3.75	5.4	6.6	5.0	2.82	4.35	3.14	2.33
18	2.22	3.00	2.92	4.8	3.65	4.6	5.4	5.0	2.72	6.6	3.12	4.0
19	2.22	2.92	2.95	4.8	3.55	4.2	4.7	5.0	2.64	4.6	3.65	3.75
20	2.22	2.86	2.85	4.6	3.5	3.85	4.6	4.2	2.59	3.9	3.23	3.16
21	2.22	2.84	2.82	4.5	3.55	3.7	4.6	3.85	2.50	3.65	3.14	3.6
22	2.44	2.80	2.81	4.9	3.7	3.7	4.2	3.65	2.50	3.37	3.00	7.6
23	2.50	2.73	2.80	4.7	3.85	3.42	3.95	3.95	2.60	3.19	5.2	4.6
24	2.50	2.64	2.90	4.9	3.95	3.30	3.85	9.6	3.40	3.00	4.3	3.75
25	2.64	2.57	2.80	6.8	3.75	3.00	3.6	7.6	3.5	4.4	3.85	3.35
26	2.87	2.70	2.75	6.0	3.55	3.24	3.48	5.6	3.11	3.7	3.42	3.14
27	2.86	2.64	2.89	5.4	3.55	6.9	3.85	6.8	2.91	3.41	3.18	3.00
28	2.78	2.61	3.12	5.0	3.75	10.5	7.1	12.1	2.91	3.20	2.96	2.93
29	2.70	2.50	3.65	4.7	.....	6.8	5.8	9.5	2.81	3.65	2.90	2.55
30	2.62	2.50	3.9	4.3	.....	5.3	5.7	6.3	2.56	3.16	2.80	2.71
31	2.55	.....	10.2	4.1	.....	4.9	.....	7.8	.....	3.46	2.60	.....

NOTE.—Observer made no notes concerning ice. Discharge relation probably not materially affected by ice during the year ending Sept. 30, 1913.

Daily discharge, in second-feet, of Tygart River at Belington, W. Va., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	197	84	110	2,390	954	812	868	1,260	2,150	90	325	73
2	172	89	86	1,200	784	758	654	1,200	1,190	67	195	59
3	151	89	146	784	896	731	603	679	824	65	178	59
4	128	89	149	2,470	2,960	628	529	554	595	87	121	62
5	91	88	265	2,000	2,550	578	505	458	570	342	96	59
6	86	82	679	1,580	1,520	505	481	390	430	385	82	59
7	81	110	1,070	5,060	954	435	458	355	363	334	70	47
8	81	2,390	628	5,720	654	386	412	329	546	264	65	73
9	74	1,580	554	6,410	603	435	390	296	745	172	59	183
10	68	954	458	2,630	578	481	386	231	694	2,070	57	134
11	61	481	346	1,520	481	896	350	212	522	5,960	54	94
12	61	868	292	4,430	868	2,390	381	200	363	1,440	92	66
13	54	296	292	3,840	896	1,580	372	189	286	1,070	595	60
14	50	265	265	2,000	1,070	1,520	355	167	210	745	6,180	53
15	49	273	175	1,930	868	3,750	381	321	189	2,150	959	47
16	45	248	167	954	628	2,470	5,170	458	159	1,190	475	47
17	45	219	172	1,130	505	1,450	2,310	1,200	137	771	226	51
18	44	200	178	1,070	458	954	1,450	1,200	114	2,230	220	595
19	44	178	186	1,070	412	731	1,010	1,200	98	904	430	475
20	44	162	159	954	390	554	954	731	88	546	257	233
21	44	156	151	896	412	481	954	554	73	430	226	407
22	74	146	149	1,130	481	481	731	458	73	309	183	3,050
23	84	130	146	1,010	554	355	603	603	90	243	1,250	904
24	84	110	172	1,130	603	304	554	5,060	321	183	745	475
25	110	97	146	2,470	505	200	435	3,120	363	797	522	302
26	164	123	134	1,860	412	281	381	1,580	216	452	329	226
27	162	110	169	1,450	412	2,550	554	2,470	159	325	239	183
28	141	104	238	1,200	505	6,060	2,710	7,950	159	246	172	164
29	123	84	458	1,010	.....	2,470	1,720	4,950	134	430	156	82
30	106	84	578	784	.....	1,390	1,650	2,000	83	233	132	112
31	93	.....	5,720	679	.....	1,130	.....	3,230	.....	346	90	.....

NOTE.—See "Accuracy" in station description.

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Monthly discharge of Tygart River at Belington, W. Va., for the year ending Sept. 30, 1913.

[Drainage area, 390 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	197	44	90.7	0.233	0.27	C.
November	2,390	82	330	.846	.94	B.
December	5,720	86	466	1.19	1.37	B.
January	6,410	679	2,020	5.18	5.97	B.
February	2,960	390	818	2.10	2.19	B.
March	6,060	200	1,220	3.13	3.61	B.
April	5,170	350	944	2.42	2.70	C.
May	7,950	167	1,410	3.62	4.17	C.
June	2,150	73	398	1.02	1.14	B.
July	5,950	65	802	2.06	2.38	C.
August	6,180	54	477	1.22	1.41	C.
September	3,050	47	281	.721	.80	B.
The year	7,950	44	774	1.98	26.95	

NOTE.—See "Accuracy" in station description.

TYGART RIVER AT FETTERMAN, W. VA.

Location.—At highway bridge at Fetterman, W. Va., three-fourths of a mile above the mouth of Otter Creek.

Records available.—June 3, 1907, to September 30, 1913.

Drainage area.—1,340 square miles.

Gage.—Standard chain gage attached to bridge; gage read daily morning and evening to hundredths. Limits of use: Hundredths below 4.0 feet, half-tenths from 4.0 to 5.5, and tenths above 5.5. The sea-level elevation of the zero of the gage is 957.86 feet.

Control.—Practically permanent; channel at measuring section broken by one pier; current sluggish at low stages.

Discharge measurements.—Made from downstream side of bridge.

Floods.—No records of floods previous to installation of gage. Highest stage recorded since the station was established, 29.1 feet in July, 1912.

Winter flow.—Ice probably does not affect the discharge relation. It is said that riffle below gage usually remains open.

Accuracy.—No discharge measurements were made at this station during the year ending September 30, 1913, but on October 30 and 31, 1913, the station was visited by engineers of the Survey, and two discharge measurements were made. These measurements indicate a change in the discharge relation as expressed by the rating table used prior to September 30, 1912, and estimates of discharge published in the following tables are based on the assumption that this change occurred gradually between the dates of the last two visits to the station—September 2, 1912, and October 30, 1913. Estimates of discharge for October, November, and December, 1912, as published in this report, differ therefore from those published in Water-Supply Paper 323. This difference varies from about 2 to 14 per cent, the maximum difference being at low stage.

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Daily gage height, in feet, of Tygart River at Fetterman, W. Va., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4.3	3.70	3.68	8.4	5.4	5.4	6.0	5.9	8.8	3.78	5.4	3.68
2	4.2	3.68	3.72	6.8	5.3	5.3	5.4	5.7	8.2	3.70	4.9	3.60
3	4.1	3.58	3.78	9.3	5.6	5.2	5.05	5.5	7.5	3.62	4.6	3.58
4	4.0	3.50	3.88	8.1	8.2	5.1	4.9	5.35	6.1	3.58	4.5	3.55
5	3.98	3.50	4.15	6.8	9.4	5.05	4.8	5.0	5.2	3.52	4.2	3.52
6	3.78	3.50	5.6	7.4	7.1	4.95	4.65	4.8	4.9	4.3	3.92	3.45
7	3.60	4.2	6.1	12.9	6.2	4.8	4.6	4.6	4.75	4.2	3.72	3.40
8	3.50	8.6	5.7	14.3	5.6	4.65	4.55	4.5	5.3	4.15	3.68	3.35
9	3.42	7.6	5.5	14.1	5.3	4.6	4.4	4.4	5.3	4.1	3.62	3.30
10	3.40	6.0	5.4	9.4	5.1	4.5	4.3	4.3	5.0	5.05	3.48	3.52
11	3.40	5.25	4.6	8.4	5.5	4.9	4.3	4.2	4.7	10.0	3.52	3.68
12	3.40	4.8	4.2	11.6	9.7	6.4	4.4	4.1	4.5	6.8	3.78	3.60
13	3.38	4.6	4.1	11.0	8.0	7.1	4.7	4.05	4.2	5.7	7.4	3.55
14	3.35	4.5	4.0	8.0	6.8	7.2	5.5	4.0	4.1	6.6	8.3	3.50
15	3.50	4.4	4.0	6.8	6.7	8.8	5.9	4.1	3.88	7.5	6.8	3.50
16	3.48	4.3	4.0	6.0	5.5	8.3	7.8	4.6	3.80	7.0	5.05	3.40
17	3.42	4.3	4.05	6.3	5.2	6.5	7.0	5.6	3.80	8.8	4.7	3.32
18	3.40	4.2	4.15	7.7	4.95	5.6	6.5	7.0	3.75	7.8	4.5	3.55
19	3.42	4.1	4.05	6.8	4.8	5.3	6.2	6.3	3.75	6.0	4.65	3.90
20	3.38	4.0	3.95	6.2	4.5	5.2	6.1	5.45	3.72	5.6	4.9	3.82
21	3.35	4.0	3.9	6.3	4.4	5.1	6.0	5.05	3.68	5.4	4.5	4.45
22	3.30	4.0	3.85	6.6	4.7	4.9	5.7	5.5	3.64	4.8	4.2	5.6
23	3.42	3.98	3.95	6.5	4.7	4.7	5.2	10.6	3.60	4.55	5.2	5.8
24	3.52	3.95	4.0	7.1	4.7	4.6	4.85	14.3	3.60	4.3	5.9	5.3
25	3.65	3.95	4.05	8.4	4.65	4.5	4.7	9.8	4.2	4.5	5.5	4.5
26	3.68	4.0	4.1	8.0	4.75	5.5	4.55	7.5	4.4	5.6	5.2	4.1
27	3.95	3.98	4.25	6.8	5.4	11.2	4.6	10.2	4.2	5.2	4.5	4.0
28	4.0	3.90	4.6	6.4	5.45	12.8	6.1	15.2	4.05	4.8	4.15	3.95
29	3.90	3.90	4.8	6.0	.....	8.6	6.7	12.6	3.88	4.7	3.98	3.80
30	3.82	3.75	6.6	5.7	.....	7.0	6.4	9.8	3.82	4.55	3.90	3.72
31	3.78	.....	12.2	5.5	.....	6.2	.....	10.1	.....	4.4	3.82	.....

NOTE.—Observer made no notes concerning ice. Discharge relation probably not materially affected by ice during the year ending Sept. 30, 1913.

Daily discharge, in second-feet, of Tygart River at Fetterman, W. Va., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	750	296	284	7,780	2,420	2,420	3,380	3,210	8,530	312	2,330	253
2	653	284	253	4,820	2,250	2,250	2,330	2,850	7,410	268	1,480	213
3	566	233	341	9,480	2,680	2,080	1,740	2,510	6,110	228	1,040	204
4	496	195	397	7,220	7,410	1,900	1,480	2,250	3,560	209	916	190
5	481	195	508	4,820	9,670	1,820	1,320	1,650	1,990	181	607	177
6	347	195	2,680	5,920	5,370	1,650	1,110	1,320	1,480	699	391	149
7	248	653	3,560	16,900	3,740	1,400	1,040	1,040	1,250	607	274	131
8	200	8,340	2,850	20,100	2,680	1,110	978	916	2,160	566	253	115
9	164	6,480	2,590	19,600	2,250	1,040	802	802	2,160	525	223	101
10	157	3,560	2,420	9,670	1,900	916	699	699	1,650	1,740	161	177
11	157	2,160	1,110	7,780	2,590	1,480	699	607	1,180	10,800	177	253
12	157	1,400	653	14,000	10,200	4,100	802	525	916	4,820	306	213
13	149	1,110	566	12,700	7,030	5,370	1,180	496	607	2,850	5,920	190
14	138	978	481	7,030	4,820	5,550	2,510	458	525	4,460	7,590	168
15	200	859	481	4,820	4,640	8,530	3,210	525	372	6,110	4,820	164
16	190	750	481	3,380	2,590	7,590	6,660	1,040	323	5,190	1,740	128
17	164	750	518	3,920	2,080	4,280	5,190	2,680	323	8,530	1,180	103
18	153	653	607	6,480	1,650	2,680	4,280	5,190	296	6,660	916	186
19	161	566	518	4,820	1,400	2,160	3,740	3,920	296	3,380	1,110	372
20	145	488	444	3,740	978	1,990	3,560	2,420	279	2,680	1,480	323
21	134	488	411	3,920	859	1,820	3,380	1,740	258	2,330	916	859
22	118	488	378	4,460	1,250	1,480	2,850	2,510	238	1,320	607	2,680
23	161	473	444	4,280	1,250	1,180	1,990	12,000	218	978	1,990	3,030
24	204	451	481	5,370	1,250	1,040	1,400	20,100	218	699	3,210	2,160
25	268	451	518	7,780	1,180	916	1,180	10,400	607	916	2,510	916
26	284	488	566	7,080	1,320	2,510	978	6,110	802	2,680	1,990	510
27	451	473	699	4,820	2,420	13,200	1,040	11,200	607	1,990	916	438
28	488	418	1,110	4,100	2,510	16,600	3,560	22,100	488	1,320	566	404
29	418	418	1,400	3,380	.....	8,160	4,640	16,200	372	1,180	431	312
30	366	323	4,460	2,850	.....	5,190	4,100	10,400	335	978	378	268
31	341	.....	15,300	2,590	.....	3,740	.....	11,000	.....	802	329	.....

NOTE.—See "Accuracy" in station description.

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Monthly discharge of Tygart River at Fetterman, W. Va., for the year ending Sept. 30, 1913.

[Drainage area, 1,340 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	750	118	287	0.214	0.25	B.
November	8,340	195	1,150	.858	.96	B.
December	15,300	253	1,540	1.15	1.33	B.
January	20,100	2,590	7,280	5.43	6.26	B.
February	10,200	859	3,230	2.41	2.51	B.
March	16,600	916	3,750	2.80	3.23	B.
April	6,660	699	2,390	1.78	1.99	B.
May	22,100	458	5,120	3.82	4.40	B.
June	8,530	218	1,520	1.13	1.26	B.
July	10,800	181	2,450	1.83	2.11	B.
August	7,590	161	1,510	1.13	1.30	B.
September	3,030	101	513	.383	.43	B.
The year	22,100	101	2,570	1.92	26.03	

NOTE.—See "Accuracy" in station description.

WEST FORK RIVER AT ENTERPRISE, W. VA.

Location.—At highway bridge at Enterprise, W. Va., three-fourths of a mile above the mouth of Bingamon Creek.

Records available.—June 2, 1907, to September 30, 1913.

Drainage area.—750 square miles.

Gage.—Standard chain gage attached to bridge; gage read daily in the morning to hundredths. Limits of use: Hundredths below 2.0, half-tenths from 2.0 to 3.5, and tenths above 3.5 feet. Sea-level elevation of zero of the gage, 869.91 feet.

Control.—Practically permanent. Channel at measuring section broken by one pier; smooth rock bottom.

Discharge measurements.—Made from downstream side of bridge.

Floods.—Flood of 1888, referred to present gage datum, reached stage about 33 feet. Maximum gage height recorded since establishment of station, 17.6 feet, January 30, 1911, and January 12, 1913.

Winter flow.—Ice may affect the discharge relation for two or three weeks at a time during December, January, and February.

The following discharge measurement was made by G. C. Stevens:
March 28, 1913: Gage height, 10.23 feet; discharge, 8,100 second-feet.

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n feet, of West Fork River at Enterprise, W. Va., for the year ending Sept. 30, 1913.

[C. M. Tetrick, observer.]

	Nov.	Dec.	Jan.	Fe	Apr.	May.	June.	July.	Aug.	Sept.
	1.60	1.40	5.2		3.1	2.3	5.2	2.0	1.56	1.20
	1.52	1.40	3.7		2.9	2.25	4.0	1.90	1.52	1.20
	1.51	1.38	4.5		2.7	2.2	3.4	1.80	1.50	1.15
	1.60	1.80	7.9		2.65	2.2	3.0	1.75	1.40	1.13
	1.60	2.05	6.		2.45	2.1	2.85	1.70	1.35	1.10
	1.55	3.0			2.1	2.1	2.7	1.63	1.30	.90
	1.70	5.6	1		2.0	2.05	2.35	1.60	1.27	.80
	3.2	4.5	1		1.93	2.0	2.2	1.54	1.20	.80
	4.2	3.0			1.81	2.0	2.15	1.50	1.15	1.00
	3.3	2.4			1.70	1.87	2.1	7.5	1.10	1.00
	2.4	2.3			2.5	1.80	1.00	5.1	1.00	.80
	2.1	2.1			2.95	1.70	1.93	3.3	1.00	.70
	2.0	1.90			2.7	1.62	1.86	3.0	1.10	1.20
	2.0	1.8			2.55	1.50	2.5	2.8	1.05	1.30
	1.98	1			2.3	1.50	1.78	2.5	1.00	1.30
	1.92				6.1	1.40	1.72	2.25	1.90	1.30
	1.85				4.5	3.7	1.62	2.1	3.5	1.40
	1.80				3.4	3.3	1.60	2.1	2.8	1.45
	1.80				3.1	3.0	1.51	2.2	2.4	1.57
	1.75				2.9	2.6	1.45	2.2	2.2	1.50
	1.7				2.7	2.4	1.40	2.05	2.1	1.50
	1.				2.65	2.2	1.30	1.90	2.0	1.50
	1.				2.45	12.4	1.30	1.82	3.0	1.60
					2.4	13.0	1.25	1.73	2.4	1.50
					2.2	7.7	1.20	3.7	2.15	1.60
					2.1	4.3	1.90	2.9	2.0	1.60
					2.1	8.2	1.80	2.6	1.82	1.50
					2.0	14.5	1.85	2.2	1.70	1.50
					2.6	8.3	1.80	1.75	1.50	1.40
					2.4	5.5	1.70	1.68	1.40	1.40
						7.3		1.60	1.30	

ng ice. Discharge relation probably not affected by ice

est Fork River at Enterprise, W. Va., for the year ing Sept. 30, 1913.

	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
360	1,160	861	767	350	2,360	227	91	43
160	893	767	649	328	1,380	190	83	43
760	861	767	540	307	959	155	79	40
180	5,860	593	514	307	707	140	64	38
250	3,460	829	418	266	621	124	58	36
180	1,920	737	266					25
200	1,090	707						20
200	1,160	441						20
670	1,160							30
	1,							30
								20
								16
								43
							33	52
					149	441	30	52
					64	130	328	190	52
			4,760	1,160	104	266	1,030	64
			959	893	99	266	593	72
		707	767	707	81	307	395	93
		566	649	489	72	307	307	79
		66	489	540	395	64	246	266	79
		514	395	514	307	52	190	227	79
		0	489	307	418	10,700	52	162	707	99
		4,200	441	266	395	11,400	48	133	395	79
	24	2,950	395	247	307	4,960	43	1,160	286	99
	1	99	2,180	395	707	266	1,600	190	649	227	99
	83	155	1,760	350	13,400	266	5,510	155	489	162	79
0	79	707	1,450	1,160	9,900	227	13,400	172	307	124	79
130	76	1,160	1,380	.....	2,950	489	5,620	155	140	79	64
124	67	1,530	1,380	.....	1,680	395	2,650	124	119	64	64
99	.....	3,670	1,230	.....	1,160	.....	4,520	.....	99	52	.....

NOTE.—Daily discharge computed from a rating curve that is well defined [illegible]

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Monthly discharge of West Fork River at Enterprise, W. Va., for the year ending Sept. 30, 1913.

[Drainage area, 750 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	441	30	111	0.148	0.17	A.
November	1,530	67	235	.313	.35	A.
December	3,670	62	548	.731	.84	A.
January	17,700	1,030	4,090	5.45	6.28	B.
February	5,860	350	1,330	1.77	1.84	B.
March	13,400	247	1,680	2.24	2.58	B.
April	3,250	124	585	.780	.87	A.
May	13,400	64	2,180	2.91	3.36	B.
June	2,360	30	345	.460	.51	A.
July	4,740	79	517	.689	.79	B.
August	1,030	30	189	.252	.29	A.
September	99	16	56	.075	.08	B.
The year	17,700	16	994	1.33	17.96	

ELK CREEK NEAR CLARKSBURG, W. VA.

Location.—At a footbridge near Clarksburg, W. Va., 300 feet above Turkey Run and about 6 miles above the mouth of the creek.

Records available.—October 11, 1910, to September 30, 1913.

Drainage area.—107 square miles (Pittsburgh Flood Commission).

Gage.—Wooden staff gage (during 1912) fastened to a tree near right abutment of footbridge. Gage read daily in the morning to hundredths. On November 1, 1913, a metal gage section (0–3 feet) was attached to the old gage, and the gage was then lowered 1.0 foot to avoid negative readings. Sea-level elevation of zero of the gage is 955.01 feet. See "Accuracy."

Control.—Rocky and practically permanent. Banks high, not subject to overflow.

Discharge measurements.—Made from footbridge at high stages; low-water measurements made by wading at section about 200 feet below bridge.

Floods.—Flood of July, 1912, reached a height of 15 feet on present gage.

Point of zero flow.—Gage height at which flow past the gage will cease is about 0.9 foot, as determined August 30, 1912.

Winter flow.—Discharge relation may be affected by ice for short periods in December, January, and February.

Accuracy.—On November 1, 1913, when gage was lowered 1.0 foot, as noted above, old gage was found to be inclined a sufficient amount to cause slight errors in readings above 6 feet. Gage was reset in a vertical position. Length of time gage was in inclined position not known; no correction applied to gage heights, as during the year ending September 30, 1913, only one reading exceeded 6 feet. All gage heights published in this report refer to the new datum. Data insufficient for estimates of discharge.

No discharge measurements were made at this station during the year ending September 30, 1913.

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Daily gage height, in feet, of Elk Creek near Clarksburg, W. Va., for the year ending Sept. 30, 1913.

[E. H. Smith, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.24	1.52	1.50	2.94	2.68	2.5	2.3	2.0	3.0	1.32	1.35	.....
2	2.15	1.58	1.50	2.5	2.2	2.4	2.1	1.9	2.7	1.3	1.3	.....
3	2.00	1.54	1.70	3.3	2.4	2.14	2.0	1.85	2.35	1.3	1.3	.....
4	1.90	1.52	1.72	3.6	4.06	2.18	1.95	1.8	2.1	.....	.....	.....
5	1.80	1.50	1.72	2.78	3.2	2.18	2.0	1.7	2.0	.....	.....	.....
6	1.70	1.49	3.10	3.5	2.8	2.2	1.9	1.68	1.9	.....	.....	.....
7	1.60	1.60	2.60	5.45	2.8	2.1	1.8	1.75	1.8	1.8	.....	.....
8	1.60	3.20	2.40	5.2	2.8	2.0	1.76	1.68	2.2	1.6	.....	.....
9	1.59	2.60	2.20	3.9	2.78	2.2	1.7	1.6	1.98	1.6	.....	1.7
10	1.58	2.10	2.00	3.0	2.48	2.2	1.8	1.6	1.8	4.3	.....	1.6
11	1.58	1.90	1.90	2.94	2.2	2.65	1.8	1.56	1.7	2.4	.....	1.48
12	1.57	1.82	1.80	7.2	4.1	2.8	2.3	1.5	1.6	2.0	.....	1.4
13	1.59	1.80	1.72	3.88	3.0	2.58	2.1	1.5	1.58	1.9	1.4	.....
14	1.60	1.82	1.64	3.0	2.9	3.66	2.1	1.5	1.56	3.8	1.5	.....
15	1.60	1.76	1.62	2.65	2.8	3.3	2.1	1.8	1.5	3.2	1.5	.....
16	1.59	1.72	1.65	2.8	2.3	2.8	3.0	1.7	1.48	2.6	1.45	.....
17	1.65	1.68	1.68	3.2	2.2	2.5	2.5	3.1	1.42	2.2	1.4	.....
18	1.62	1.64	1.68	3.28	2.2	2.3	2.3	2.8	1.40	2.5	1.3	.....
19	1.58	1.62	1.80	3.1	2.08	2.16	2.1	2.3	1.38	2.2	1.9	.....
20	1.60	1.60	1.75	2.8	2.1	2.1	2.08	2.0	1.3	2.0	1.7	.....
21	1.60	1.59	1.70	3.1	2.1	2.1	2.0	1.9	1.3	1.9	1.5	.....
22	1.58	1.58	1.64	3.3	2.1	2.0	1.85	1.8	1.35	1.8	3.35	1.7
23	1.87	1.58	1.60	3.0	2.1	1.9	1.8	6.8	1.38	1.7	2.8	1.7
24	1.80	1.57	1.60	3.5	2.06	1.9	1.78	5.4	1.48	1.65	2.2	1.55
25	1.70	1.56	1.60	3.6	1.98	1.8	1.6	3.2	1.60	1.65	1.9	1.45
26	1.75	1.55	1.60	3.0	1.9	2.6	1.6	2.7	1.70	1.7	1.75	1.4
27	1.72	1.54	1.90	2.7	1.9	7.3	2.1	6.2	1.60	1.6	1.5	1.3
28	1.68	1.53	2.80	2.8	2.7	3.86	2.3	6.5	1.46	1.5	1.48	.....
29	1.65	1.52	2.78	2.65	.....	2.98	2.16	3.7	1.40	1.45	1.4	.....
30	1.62	1.51	3.20	2.5	.....	2.6	2.2	2.86	1.32	1.4	1.35	.....
31	1.56	.....	4.30	2.45	.....	2.4	.....	4.8	.....	1.4	1.3	.....

NOTE.—Observer made no report relative to ice. Discharge relation probably not materially affected by ice during the year ending Sept. 30, 1913.
Water below gage July 4–6, Aug. 4–12, Sept. 1–8, 13–21, and 28–30. See "Gage" in station description.

CHEAT RIVER NEAR PARSONS, W. VA.

Location.—At highway bridge, 3 miles below the confluence of Shavers and Dry forks and 2 miles due north of Parsons, W. Va.

Records available.—Gage heights, January 1 to September 30, 1913. First discharge measurement made August 24, 1912.

Drainage area.—716 square miles (determined by West Virginia Development Co.).

Gage.—Standard chain gage attached to bridge; gage read daily morning and evening to tenths. Limits of use: Half-tenths below 4.0 and tenths above 4.0.

Control.—Rocky; probably permanent.

Discharge measurements.—Made from downstream side of bridge.

Winter flow.—Discharge relation affected by ice during severe winters.

Accuracy.—Gage-height record probably reliable; data insufficient for estimates of discharge.

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Discharge measurements of Cheat River near Parsons, W. Va., in the years ending Sept. 30, 1912–13.

[Hydrographer, H. P. Drake, engineer of the Pittsburgh Hydro-Electric Co.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1912.	*Feet.*	*Sec.-ft.*	1913.	*Feet.*	*Sec.-ft.*
Aug. 24	2.93	704	May 12	2.57	494
Do	[a] 2.93	708	Do	[a] 2.57	496
Dec. 20	2.60	454	June 12	3.02	811
			Do	[a] 3.02	810
			Sept. 5	2.06	198
			Do	[a] 2.06	198

[a] Same soundings used as for other measurement on this date.

Daily gage height, in feet, of Cheat River near Parsons, W. Va., for the year ending Sept. 30, 1913.

[O. C. Callihan, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4.4	4.1	4.2	4.3	.....	3.6	2.9	3.25	2.25
2	4.2	3.85	3.85	3.9	.....	3.5	2.9	2.9	2.15
3	5.6	3.9	3.7	(a)	.....	3.45	2.8	2.8	2.15
4	5.1	5.1	3.6	.....	.....	3.35	2.95	2.6	2.05
5	5.6	4.7	3.5	.....	.....	3.2	3.05	2.45	2.05
6	6.4	4.1	3.3	.....	.....	3.2	3.35	2.5	2.05
7	7.1	3.65	3.3	.....	.....	3.65	3.2	2.35	2.25
8	9.8	3.15	3.15	.....	.....	3.9	2.85	2.4	2.6
9	7.4	3.0	3.15	.....	.....	3.65	2.8	2.3	2.55
10	5.6	3.15	3.7	.....	.....	3.35	7.5	2.25	2.3
11	5.0	4.2	5.2	.....	.....	3.2	5.5	2.7	2.2
12	6.4	4.7	5.2	.....	.....	2.95	3.9	3.0	2.1
13	5.8	4.0	5.4	.....	.....	2.8	4.4	6.9	2.0
14	4.8	3.5	6.8	.....	.....	2.75	5.8	5.5	2.0
15	4.3	3.2	6.4	.....	.....	2.7	5.2	3.95	2.0
16	4.2	3.05	5.4	.....	.....	2.6	4.0	3.4	1.95
17	4.6	3.35	4.6	.....	.....	2.5	5.4	3.0	2.05
18	4.4	3.75	4.4	.....	.....	2.35	5.6	2.85	3.25
19	4.2	4.4	4.4	.....	.....	2.2	4.4	2.85	3.0
20	3.95	4.6	4.4	.....	.....	2.15	3.6	2.85	2.7
21	3.85	4.8	4.2	.....	.....	2.2	3.4	2.5	5.6
22	4.2	4.7	3.9	.....	.....	2.55	3.25	2.5	5.2
23	4.2	4.3	3.7	.....	.....	3.5	3.2	3.95	5.0
24	5.0	3.7	3.7	.....	.....	3.8	3.1	4.2	4.3
25	5.2	3.5	3.6	.....	.....	3.85	3.45	3.7	3.55
26	4.5	3.35	3.85	.....	.....	4.4	3.3	3.15	2.8
27	4.3	3.2	8.0	.....	.....	3.9	2.9	2.7	2.55
28	4.0	4.2	6.8	.....	.....	3.5	2.85	2.5	2.45
29	3.75	.....	5.3	.....	.....	3.25	3.2	2.35	2.45
30	3.45	.....	4.9	.....	.....	3.1	2.85	2.35	2.4
31	4.1	.....	4.4	.....	(a)	.....	3.55	2.25	.....

[a] Gage not read Apr. 3–May 31, 1913.

NOTE.—Observer made no report concerning ice. Discharge relation probably not materially affected by ice during the year ending Sept. 30, 1913.

CHEAT RIVER NEAR MORGANTOWN, W. VA.

Location.—At highway bridge at Uneva, W. Va., 10 miles above mouth of river. Parallel of latitude 39° 40′ crosses the river at this bridge.

Records available.—July 8 to December 30, 1899; July 1 to December 29, 1900; August 21, 1902, to December 31, 1905; November 18, 1908, to September 30, 1913.

Drainage area.—1,380 square miles.

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Gage.—Standard chain gage attached to bridge. Gage read daily, morning and evening, to hundredths. Limits of use: Hundredths below 2.0, half-tenths from 2.0 to 4.5, and tenths above 4.5 feet. See history of this station in Water-Supply Papers 263 and 283.

Control.—Probably permanent.

Discharge measurements.—Made from upstream side of bridge or, at low water, by wading.

Winter flow.—Ice forms sometimes to a thickness of several inches, and large ice jams may affect the discharge relation during short periods in December, January, and February.

Accuracy.—Station not visited by United States Geological Survey engineers during the year ending September 30, 1913. On November 3 and 4, 1913, bench marks and elevation of the zero of the gage were checked with a wye level and two discharge measurements were made by Survey engineers. Measurements check revised rating curve used for 1912, as noted in Water-Supply Paper 323.

Discharge measurements of Cheat River near Morgantown, W. Va., for the year ending Sept. 30, 1913.

[Hydrographer, H. P. Drake, engineer of the Pittsburgh Hydro-Electric Co.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1913.	*Feet.*	*Sec.-ft.*	1913.	*Feet.*	*Sec.-ft.*
Jan. 8	9.55	29,100	June 9	3.88	2,960
Do	9.55	29,200	Do	3.88	2,870
May 14	2.78	746	Sept. 3	2.20	a 329
Do	2.78	735	Do	2.20	a 329

a Measurement by wading one-third mile above gage.

Daily gage height, in feet, of Cheat River near Morgantown, W. Va., for the year ending Sept. 30, 1913.

[C. F. Baker, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3.7	2.9	2.55	5.4	4.1	4.6	4.25	4.2	5.9	3.0	3.4	2.3
2	3.55	2.9	2.65	4.5	4.2	4.35	3.95	4.0	5.0	2.85	3.25	2.2
3	3.35	2.85	3.2	4.9	4.0	4.0	3.95	3.65	4.4	2.8	3.0	2.2
4	3.2	2.85	3.3	5.6	4.9	3.75	3.8	3.5	3.95	2.7	2.85	2.2
5	3.05	2.75	3.35	5.0	4.8	3.75	3.6	3.35	3.75	2.7	2.8	2.1
6	3.0	2.75	3.5	4.8	4.3	3.65	3.6	3.3	3.55	3.1	2.6	2.1
7	2.9	.....	5.0	8.7	3.9	3.4	3.4	3.2	3.45	3.45	2.5	2.05
8	2.8	6.9	4.4	9.4	3.85	3.15	3.4	3.05	3.6	3.15	2.45	2.05
9	2.75	5.4	3.95	8.0	3.7	3.4	3.3	3.05	3.9	2.9	2.4	2.15
10	2.75	4.5	3.65	.....	3.6	3.65	.....	3.0	3.55	4.3	2.4	2.55
11	2.7	4.05	3.45	5.2	3.45	4.35	3.05	.....	3.35	5.7	2.4	2.5
12	2.6	3.9	3.35	7.8	5.5	5.3	3.45	2.8	3.15	4.25	2.5	2.35
13	2.6	3.65	3.2	6.9	4.6	4.8	3.5	2.8	3.05	3.8	2.9	2.25
14	2.6	3.65	3.15	5.4	4.0	4.9	4.9	2.8	3.0	4.7	5.4	2.15
15	2.55	3.6	3.2	4.7	3.95	6.0	4.6	3.2	2.9	5.8	3.9	2.15
16	2.5	3.5	3.15	4.45	3.55	5.6	6.1	3.7	2.75	5.1	3.4	2.1
17	2.45	3.35	3.1	4.8	3.4	4.7	5.2	3.7	2.7	4.8	3.05	2.0
18	2.45	3.25	3.0	5.0	3.3	4.25	4.5	.....	2.6	6.0	2.9	2.1
19	2.45	3.2	3.05	4.9	3.25	4.0	4.15	4.3	2.55	4.8	2.85	2.6
20	2.5	3.1	3.15	4.6	3.3	3.85	4.0	3.85	2.5	4.4	2.75	2.95
21	2.45	3.05	3.1	4.45	3.65	3.7	3.9	3.95	2.8	3.8	2.75	2.8
22	2.6	2.95	3.1	4.5	4.1	3.6	3.7	4.5	2.6	3.5	2.6	4.8
23	2.65	2.9	2.85	4.4	4.3	3.5	3.6	6.6	2.6	3.25	2.55	3.85
24	2.85	2.9	.....	5.1	4.15	3.4	3.45	8.2	3.3	3.1	2.65	3.3
25	2.95	2.9	2.8	5.5	3.85	3.3	3.35	.....	3.75	3.2	3.15	3.05
26	3.9	2.85	2.8	5.1	3.45	4.3	3.25	5.1	4.0	3.6	2.85	2.85
27	3.65	2.8	2.85	4.6	3.5	7.5	.....	6.9	3.45	3.25	2.7	2.7
28	3.45	2.7	3.1	4.3	4.3	7.6	4.4	8.6	3.85	3.0	2.55	2.55
29	3.25	2.65	3.25	4.05	.....	5.7	4.3	6.6	3.4	3.05	2.5	2.5
30	3.1	2.6	4.05	3.85	.....	5.0	4.35	5.5	3.25	3.05	2.4	2.45
31	3.0	.....	6.9	3.85	.....	4.5	.....	8.1	.....	3.0	2.3	.....

NOTE.—Observer made no notes concerning ice. Discharge relation probably not affected by ice during the year ending Sept. 30, 1913.

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Daily discharge, in second-feet, of Cheat River near Morgantown, W. Va., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,200	805	512	9,040	3,300	5,110	3,790	3,620	11,600	915	1,520	375
2	1,840	805	585	4,700	3,620	4,140	2,850	3,000	7,000	758	1,260	330
3	1,430	758	1,180	6,500	3,000	3,000	2,860	2,080	4,320	710	915	330
4	1,180	758	1,340	10,100	6,500	2,320	2,450	1,730	2,860	625	758	330
5	980	668	1,430	7,000	6,020	2,320	1,960	1,430	2,320	625	710	290
6	915	668	1,730	6,020	3,960	2,080	1,960	1,340	1,840	1,040	545	290
7	805	a 8,680	7,000	25,900	2,710	1,520	1,520	1,180	1,620	1,620	480	272
8	710	16,700	4,320	29,400	2,580	1,120	1,520	980	1,960	1,120	452	272
9	668	9,040	2,860	22,300	2,200	1,520	1,340	980	2,710	805	425	310
10	668	4,700	2,080	a15,200	1,960	2,080	a 1,160	915	1,840	3,960	425	512
11	625	3,150	1,620	8,020	1,620	4,140	980	a 812	1,430	10,600	425	480
12	545	2,710	1,430	21,300	9,550	8,530	1,620	710	1,120	3,790	480	400
13	545	2,080	1,180	16,700	5,110	6,020	1,730	710	980	2,450	805	352
14	545	2,080	1,120	9,040	3,000	6,500	6,500	710	915	5,550	9,040	310
15	512	1,960	1,180	5,550	2,860	12,100	5,110	1,180	805	11,100	2,710	310
16	480	1,730	1,120	4,510	1,840	10,100	12,600	2,200	668	7,510	1,520	290
17	452	1,430	1,040	6,020	1,520	5,550	8,020	2,200	625	6,020	980	255
18	452	1,260	915	7,000	1,340	3,790	4,700	a 3,080	545	12,100	805	290
19	452	1,180	980	6,500	1,260	3,000	3,460	3,960	512	6,020	758	545
20	480	1,040	1,120	5,110	1,340	2,580	3,000	2,580	480	4,320	668	860
21	452	980	1,040	4,510	2,080	2,200	2,710	2,860	710	2,450	668	710
22	545	860	1,040	4,700	3,300	1,960	2,200	4,700	545	1,730	545	6,020
23	585	805	758	4,320	3,960	1,730	1,960	15,200	545	1,260	512	2,580
24	758	805	a 734	7,510	3,460	1,520	1,620	23,300	1,340	1,040	585	1,340
25	2,860	805	710	9,550	2,580	1,340	1,430	a15,400	2,320	1,180	1,120	980
26	2,710	758	710	7,510	1,620	3,960	1,260	7,510	3,000	1,960	758	758
27	2,080	710	758	5,110	1,730	19,800	a 2,790	16,700	1,620	1,260	625	625
28	1,620	625	1,040	3,960	3,960	20,300	4,320	25,400	2,580	915	512	512
29	1,260	585	1,260	3,150	.....	10,600	3,960	15,200	1,520	980	480	480
30	1,040	545	3,150	2,580	.....	7,000	4,140	9,550	1,260	980	425	452
31	915	.....	16,700	2,580	.....	4,700	.....	22,800	.....	915	375	.....

a Interpolated.

NOTE.—Daily discharge computed from a rating curve well defined between 115 and 47,800 second-feet gage heights 1.5 and 13.0 feet).

Monthly discharge of Cheat River near Morgantown, W. Va., for the year ending Sept. 30, 1913.

[Drainage area, 1,380 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	2,860	452	1,010	0.732	0.84	B.
November	16,700	545	2,320	1.68	1.87	A.
December	16,700	512	2,020	1.46	1.68	A.
January	29,400	2,580	9,080	6.58	7.59	A.
February	9,550	1,260	3,140	2.28	2.37	A.
March	20,300	1,120	5,250	3.80	4.38	A.
April	12,600	980	3,180	2.30	2.57	A.
May	25,400	710	6,260	4.54	5.23	B.
June	11,600	480	2,050	1.49	1.66	B.
July	12,100	625	3,110	2.25	2.59	A.
August	9,040	375	1,040	.754	.87	A.
September	6,020	255	729	.528	.59	B.
The year	29,400	255	3,280	2.38	32.24	

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SHAVERS FORK AT PARSONS, W. VA.

Location.—At steel highway bridge 600 feet northwest of the railroad station at Parsons, W. Va., one-third mile above confluence with Dry Fork.

Records available.—October 14, 1910, to September 30, 1913.

Drainage area.—210 square miles (Pittsburgh Flood Commission).

Gage.—Standard chain gage attached to bridge, read daily morning and evening to tenths. Limits of use: Half-tenths below 7.0 and tenths above 7.0. Sea-level elevation of zero of gage, 1,631.70 feet.

Control.—Rocky; probably permanent.

Discharge measurements.—Made from downstream side of bridge or (at low stages) by wading.

Floods.—High waters of 1888 and 1907 reached a height of approximately 12.5 feet referred to present gage datum.

Point of zero flow.—Levels run September 4, 1912, indicate that there would be no flow past the gage if the river were to fall to a stage of 1.8 feet ±0.2 foot.

Winter flow.—Discharge relation affected by ice during severe winters.

Accuracy.—Most discharge measurements at this station prior to 1913 were made by subsurface method; coefficients used in computations vary from 0.88 to 0.95. (See introduction to Water-Supply Paper 263.) Estimates of daily and monthly discharge for the year ending September 30, 1912, appear excessive. Gage-height record not thoroughly reliable, as noted in the footnote to the table of daily gage height in Water-Supply Paper 323, page 36; therefore data for 1912 should be used with caution and should be compared with those for other gaging stations in the locality and with records of precipitation.

Cooperation.—Established and maintained by Pittsburgh Flood Commission until taken over by the United States Geological Survey, July 1, 1912.

Discharge measurements of Shavers Fork at Parsons, W. Va., in the year ending Sept. 30, 1913.

[Hydrographer, H. P. Drake, engineer of the Pittsburgh Flood Commission.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
1912.	*Feet.*	*Sec.-ft.*	1913.	*Feet.*	*Sec.-ft.*
Dec. 24	3.18	144	June 12	3.36	256
			Do	3.36	259
1913.			Sept. 5	2.78	a 50
May 10	3.23	176	Do	2.78	a 52
Do	3.23	177			

a Measurement made by wading at a section about 300 feet above Western Maryland Railroad bridge.

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Daily gage height, in feet, of Shavers Fork at Parsons, W. Va., for the years ending Sept. 30, 1911–1913.

[R. W. Evans, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1911.[a]												
1	.....	2.97	4.54	3.90	5.78	3.06	3.94	3.62	3.60	3.38	2.76	4.64
2	.....	2.97	3.54	4.50	4.48	3.26	4.44	3.62	3.60	3.08	2.76	3.74
3	.....	3.07	3.54	5.90	4.18	3.26	4.54	3.42	3.60	2.78	2.96	3.54
4	.....	2.97	3.74	5.30	4.08	3.26	4.64	3.52	3.40	2.78	2.86	3.44
5	.....	2.97	3.54	4.70	3.88	3.26	6.24	3.62	3.40	2.78	2.76	3.34
6	.....	3.07	3.24	3.90	3.88	3.36	5.64	3.52	3.60	2.78	2.66	3.34
7	.....	2.97	3.24	3.70	3.78	4.56	5.64	3.42	3.80	2.68	1.86	3.14
8	.....	2.97	3.14	3.60	3.68	4.46	5.44	3.52	4.00	2.78	2.56	3.24
9	.....	2.97	2.94	3.50	3.88	2.96	5.24	3.42	3.90	2.78	2.66	2.94
10	.....	2.97	3.04	3.20	3.78	4.16	5.04	3.32	3.80	2.68	2.56	2.74
11	.....	2.97	3.14	3.20	3.68	4.06	4.84	3.02	3.90	2.88	2.46	3.74
12	.....	2.97	3.14	3.50	3.78	3.96	4.64	3.12	3.80	3.38	2.46	4.34
13	.....	2.97	3.14	7.20	3.48	4.46	4.84	3.02	3.80	3.18	2.36	3.74
14	2.89	2.77	2.94	6.50	3.48	4.96	5.04	3.12	4.00	3.08	2.46	3.74
15	2.89	2.97	2.94	5.50	3.38	5.26	5.64	3.22	3.90	2.98	2.56	2.84
16	2.80	2.97	2.94	5.60	3.38	5.06	4.74	2.92	3.80	2.98	2.66	6.74
17	2.89	2.77	2.94	4.50	3.48	3.96	4.44	3.02	3.70	2.98	2.66	5.44
18	2.89	2.87	2.94	4.10	3.58	3.86	4.44	2.92	4.40	2.78	2.56	4.34
19	2.80	2.87	3.14	3.90	3.48	4.06	4.04	2.82	4.00	2.88	2.56	3.74
20	2.89	2.87	3.04	3.80	3.68	4.66	4.64	2.82	4.00	2.68	2.56	3.94
21	2.89	2.77	2.94	3.60	3.58	4.46	4.84	2.92	3.80	2.78	2.66	4.04
22	2.89	2.87	3.04	4.50	3.48	4.36	5.04	2.82	3.80	2.78	2.66	3.94
23	3.10	2.87	3.14	4.50	3.28	4.06	4.84	1.92	3.70	2.98	2.86	3.84
24	3.20	2.87	3.74	4.40	3.28	3.96	4.24	2.62	3.80	2.88	2.66	3.74
25	3.00	2.97	3.74	4.60	3.08	3.86	4.04	2.62	4.00	2.78	2.86	3.74
26	3.00	3.77	3.54	4.80	3.28	3.56	4.14	2.72	3.80	2.78	2.56	3.84
27	3.00	3.57	3.24	5.70	3.28	3.46	4.04	4.22	4.00	2.78	2.46	3.94
28	3.00	3.67	3.24	5.60	3.18	3.46	3.84	4.02	3.80	2.68	2.66	4.04
29	3.03	4.87	3.84	5.30	.....	3.66	4.04	3.82	3.70	2.58	2.86	3.94
30	3.01	3.97	5.94	9.90	.....	3.86	3.64	3.72	3.40	2.68	2.96	3.74
31	3.00	.....	4.84	5.90	.....	4.06	.....	3.72	.....	2.88	6.36	.....
1912.												
1	5.72	3.20	3.90	5.4	4.2	5.4	5.0	3.2	3.0	3.4	4.1	3.4
2	5.12	3.40	3.90	5.0	4.1	5.4	5.1	3.1	3.1	3.3	3.2	3.3
3	4.72	3.30	3.80	4.9	3.6	5.2	4.9	3.2	3.0	3.3	3.3	3.2
4	4.72	3.20	3.70	4.6	3.2	5.0	4.6	3.2	3.1	4.8	3.3	3.01
5	4.62	3.10	3.80	4.3	3.2	4.8	4.5	3.1	3.0	4.4	3.2	3.02
6	4.32	4.20	3.60	4.0	3.0	4.7	4.6	3.4	2.1	4.3	3.1	3.01
7	4.72	5.50	3.40	4.0	3.0	5.0	4.2	3.5	3.1	4.2	3.2	2.81
8	5.32	4.20	3.50	3.6	3.1	5.2	4.1	3.4	3.0	3.1	3.2	2.81
9	4.72	4.00	3.40	.....	3.0	5.3	4.0	3.3	2.1	3.6	3.2	2.72
10	4.92	3.90	3.30	.....	3.1	5.4	4.2	4.0	2.8	3.3	3.1	2.10
11	5.02	3.80	3.20	.....	3.2	5.2	4.1	3.8	2.8	3.3	3.0	2.01
12	3.82	3.60	3.30	.....	3.3	5.3	3.6	7.0	2.8	3.3	3.0	2.02
13	4.22	3.50	3.40	.....	3.2	4.6	3.4	6.3	2.6	3.5	3.1	2.03
14	3.90	3.40	3.50	.....	3.1	4.8	3.5	6.0	2.8	3.4	3.0	2.02
15	4.10	3.40	3.60	.....	3.0	5.3	3.4	5.8	2.8	4.2	3.0	2.82
16	4.70	3.50	4.00	.....	3.1	7.3	3.3	6.1	2.8	4.0	3.1	3.00
17	4.00	3.40	4.60	.....	3.0	.....	3.6	5.9	2.9	4.0	3.0	3.02
18	7.40	.....	4.20	.....	3.2	.....	3.5	5.0	4.4	6.3	2.9	3.01
19	5.00	.....	4.30	.....	3.5	.....	4.0	4.6	4.5	6.0	3.0	2.90
20	4.60	.....	4.20	5.2	3.7	.....	4.0	4.0	4.6	4.4	3.1	3.02
21	4.20	.....	4.10	5.3	3.8	.....	3.8	3.7	3.1	4.0	3.3	3.00
22	4.50	.....	3.70	5.0	3.9	6.1	3.7	3.7	3.9	7.6	3.2	3.00
23	4.60	.....	4.00	5.1	4.3	5.7	3.6	3.6	4.0	6.6	3.6	3.22
24	4.40	3.70	4.20	5.0	4.4	4.8	3.4	3.5	4.0	5.0	3.4	4.80
25	4.00	3.60	4.60	4.9	4.6	4.7	3.5	3.4	3.0	8.0	3.2	5.0
26	4.00	3.50	5.00	4.8	6.1	4.7	3.6	3.2	3.1	4.2	3.4	4.05
27	3.50	3.60	5.10	4.6	7.4	4.6	3.4	3.4	3.9	4.4	3.6	4.05
28	3.40	3.40	5.00	4.5	6.5	5.0	3.5	3.1	3.7	4.0	3.4	3.82
29	3.30	3.30	4.90	4.8	5.6	5.2	3.6	3.2	3.9	3.9	3.3	3.55
30	3.40	3.40	4.60	5.1	.....	6.0	3.5	3.1	3.6	4.2	3.3	3.42
31	3.30	.....	5.00	4.8	.....	5.0	.....	3.1	.....	4.1	3.4	.....

[a] This and all similar headings in this paper indicate the year ending Sept. 30 (climatic year), which includes three months of the preceding calendar year.

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Daily gage height, in feet, of Shavers Fork at Parsons, W. Va., for the years ending Sept. 30, 1911–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1913.												
1	3.30	3.23	2.87	4.2	3.85	4.1	4.2	4.0	4.5	3.0	3.4	3.1
2	3.22	3.08	2.97	4.0	3.9	4.0	4.05	3.8	4.0	3.0	3.3	3.05
3	3.25	3.00	3.07	3.9	4.3	3.9	4.0	3.6	3.75	.....	3.2	2.9
4	3.02	2.83	3.02	4.0	4.4	3.8	3.7	3.6	3.7	.....	3.15	2.9
5	3.10	2.70	3.07	4.2	4.35	3.6	3.8	3.55	3.6	.....	3.0	2.8
6	3.05	2.88	3.87	4.35	4.0	3.7	3.8	3.5	3.75	.....	2.95	2.85
7	3.00	3.03	3.72	6.3	3.6	3.8	3.7	3.4	3.85	3.2	2.9	2.9
8	3.10	6.2	3.87	6.6	3.5	3.7	3.5	3.35	3.8	3.2	2.9	3.05
9	2.95	6.0	3.77	6.0	3.4	4.0	3.45	3.35	3.85	3.3	2.9	3.3
10	2.92	4.18	3.72	4.35	3.3	4.2	3.5	3.3	3.75	5.45	2.8	3.2
11	2.85	3.98	3.57	4.2	3.4	4.5	3.6	3.2	3.55	5.0	2.95	3.1
12	2.75	3.73	3.47	4.0	4.5	4.7	3.7	3.1	3.3	4.55	3.15	3.0
13	3.00	3.78	3.42	4.1	4.3	4.5	4.2	3.0	3.3	4.7	6.7	3.0
14	3.10	3.93	3.12	4.0	4.3	4.3	4.5	3.2	3.2	4.65	4.95	2.9
15	2.85	3.78	3.02	4.0	4.15	5.1	5.2	3.3	3.2	5.0	4.05	2.9
16	2.90	3.73	3.17	4.1	4.0	4.9	5.4	3.5	3.05	4.5	4.0	2.75
17	2.80	3.58	3.07	3.95	3.45	4.6	4.8	4.0	3.0	4.3	.....	2.45
18	2.92	3.68	3.17	4.0	3.35	4.4	4.5	4.4	3.0	4.5	3.35	3.55
19	3.10	3.63	3.12	4.0	3.25	4.4	4.4	4.3	2.95	4.15	3.25	3.45
20	2.95	3.48	3.07	3.95	3.4	4.2	4.3	4.1	2.85	3.6	3.2	3.25
21	2.80	3.38	3.02	3.8	3.3	4.3	4.3	4.2	2.8	3.45	3.1	5.4
22	2.95	3.40	2.97	4.0	4.0	4.0	4.1	4.6	3.0	3.35	3.0	4.6
23	3.02	3.33	2.77	4.05	4.1	3.8	4.0	5.1	3.15	3.3	4.05	3.85
24	3.45	3.30	2.87	4.0	3.8	3.4	3.8	6.3	3.35	3.3	3.4	3.5
25	3.60	3.38	.....	4.0	3.35	4.0	3.6	4.6	3.45	3.55	3.2	3.3
26	3.55	3.33	.....	4.2	3.5	4.6	3.7	5.2	3.45	3.45	3.2	3.25
27	3.50	3.18	3.27	4.1	3.6	7.3	4.0	6.25	3.45	3.3	3.3	3.15
28	2.95	3.28	3.17	4.0	3.7	6.6	4.2	6.45	3.3	3.2	3.2	3.1
29	2.83	3.12	3.07	3.8	.....	4.8	4.4	5.2	3.3	3.25	3.15	3.1
30	3.30	2.87	5.15	3.9	.....	4.6	4.6	5.35	3.2	3.2	3.05	3.05
31	3.25	.....	5.25	3.65	.....	4.1	.....	5.3	.....	3.75	3.0	.....

NOTE.—Discharge relation probably affected by ice about Dec. 25, 1912, to Jan. 1, 1913, and Feb. 8 to 16, 1913. Observer reported river frozen over Dec. 25–26, "ice going out" Dec. 30, and "ice backing up," Dec. 31, 1912.

Daily discharge, in second-feet, of Shavers Fork at Parsons, W. Va., for the years ending Sept. 30, 1911–1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1911.												
1	.....	94	1,290	590	3,140	115	628	364	350	226	56	1,420
2	.....	94	314	1,240	1,220	176	1,170	364	350	120	56	452
3	.....	118	.....	3,350	869	176	1,290	246	350	59	92	314
4	.....	94	.....	2,360	765	176	1,420	302	235	59	72	257
5	.....	94	.....	1,500	572	176	3,980	364	235	59	56	208
6	.....	118	.....	590	572	217	2,900	302	350	59	43	208
7	.....	94	.....	420	484	1,320	2,900	246	500	46	72	137
8	.....	94	.....	350	406	1,190	2,570	302	685	59	32	169
9	.....	94	.....	290	572	92	2,270	246	590	59	43	87
10	.....	94	.....	155	484	848	1,980	199	500	46	32	54
11	.....	94	.....	155	406	745	1,700	105	590	76	23	452
12	.....	94	.....	290	484	647	1,420	131	500	226	23	1,050
13	.....	94	.....	5,890	279	1,190	1,700	105	500	149	16	452
14	77	58	.....	4,470	279	1,860	1,980	131	685	120	23	452
15	77	94	.....	2,670	226	2,300	2,900	162	590	96	32	69
16	62	94	.....	2,830	226	2,000	1,560	83	500	96	43	4,960
17	77	58	.....	1,240	279	647	1,170	105	420	96	43	2,570
18	77	74	.....	785	338	554	1,170	83	1,120	59	32	1,060
19	62	74	.....	590	279	745	725	65	685	76	32	452
20	77	74	.....	500	406	1,450	1,420	65	685	46	32	628
21	77	58	.....	350	338	1,190	1,700	83	500	59	43	725
22	77	74	.....	1,240	279	1,070	1,980	65	500	59	43	628
23	125	74	.....	1,240	183	745	1,700	83	420	96	72	536
24	155	74	452	1,120	183	647	934	38	500	76	43	452
25	100	94	452	1,370	120	554	725	38	685	59	72	452
26	100	476	314	1,640	183	326	827	51	500	59	32	536
27	100	332	169	3,000	183	268	725	912	685	59	23	628
28	100	399	169	2,830	149	268	536	705	500	46	43	725
29	108	1,740	536	2,360	.....	392	725	518	420	34	72	628
30	102	656	3,420	12,300	.....	554	378	436	235	46	92	452
31	100	.....	1,700	3,350	.....	745	.....	436	.....	76	4,200	.....

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Daily discharge, in second-feet, of Shavers Fork, at Parsons, W. Va., for the years ending Sept. 30, 1911–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1912.												
1	3,030	155	590	2,510	890	2,510	1,920	155	100	235	785	235
2	2,090	235	590	1,920	785	2,510	2,060	125	125	190	155	190
3	1,530	190	500	1,780	350	2,210	1,780	155	100	190	190	155
4	1,530	155	420	1,370	155	1,920	1,370	155	125	1,640	190	102
5	1,400	125	500	1,000	.....	1,640	1,240	125	100	1,120	155	105
6	1,020	890	350	685	.....	1,500	1,370	235	125	1,000	125	102
7	1,530	2,670	235	.....	.....	1,920	890	290	125	890	155	64
8	2,390	890	290	.....	.....	2,210	785	235	100	125	155	64
9	1,530	685	235	.....	.....	2,360	685	190	125	350	155	51
10	1,810	590	190	.....	.....	2,510	890	685	62	190	125	125
11	1,950	500	155	.....	.....	2,210	785	500	62	190	100	102
12	518	350	190	.....	.....	2,360	350	5,470	62	190	100	105
13	912	290	235	.....	.....	1,370	235	4,090	36	290	125	108
14	590	235	290	.....	.....	1,640	290	3,530	62	235	100	105
15	785	235	350	.....	.....	2,360	235	3,170	62	890	100	65
16	1,500	290	685	.....	.....	6,110	190	3,710	62	685	125	100
17	685	235	1,370	.....	.....	5,000	350	3,350	79	685	100	105
18	6,330	350	890	.....	.....	3,500	290	1,920	1,120	4,090	79	102
19	1,920	700	1,000	.....	.....	2,000	685	1,370	1,240	3,530	100	79
20	1,370	1,200	890	2,210	.....	2,200	685	685	1,370	1,120	125	105
21	890	900	785	2,360	500	2,700	500	420	785	685	190	100
22	1,240	700	420	1,920	590	3,710	420	420	590	6,790	155	100
23	1,370	500	685	2,060	1,000	3,000	350	350	685	4,670	350	162
24	1,120	420	890	1,920	1,120	1,640	235	290	685	1,920	235	1,640
25	685	350	1,370	1,780	1,370	1,500	290	235	100	7,740	155	1,920
26	685	290	1,920	1,640	3,710	1,500	350	155	125	890	235	735
27	290	350	2,060	1,370	6,330	1,370	235	235	590	1,120	350	735
28	235	235	1,920	1,240	4,470	1,920	290	125	420	685	235	518
29	190	190	1,780	1,640	2,930	2,210	350	155	590	590	190	320
30	235	235	1,370	2,060	.....	3,530	290	125	350	890	190	246
31	190	.....	1,920	1,640	.....	1,920	.....	125	.....	785	235	.....
1913.												
1	190	166	74	.....	562	800	905	700	1,260	98	245	124
2	162	120	94	700	605	700	750	520	700	98	198	111
3	172	100	118	605	1,020	605	700	365	480	110	158	76
4	105	67	105	700	1,140	520	440	365	440	120	141	76
5	125	48	118	905	1,080	365	520	332	365	140	98	56
6	112	76	563	1,080	700	440	520	300	480	150	87	66
7	100	108	436	4,090	365	520	440	245	562	158	76	76
8	125	3,900	563	4,670	.....	440	300	222	520	158	76	111
9	90	3,530	476	3,530	.....	700	272	222	562	198	76	198
10	83	869	436	1,080	.....	905	300	198	480	2,590	56	158
11	70	666	332	905	.....	1,260	365	158	332	1,930	87	124
12	55	444	274	700	.....	1,520	440	124	198	1,320	141	98
13	100	484	246	800	.....	1,260	905	98	198	1,520	4,870	98
14	125	618	131	700	.....	1,020	1,260	158	158	1,460	1,860	76
15	70	484	105	700	.....	2,070	2,220	198	158	1,930	750	76
16	79	444	146	800	.....	1,790	2,510	300	111	1,260	700	48
17	62	338	118	652	272	1,390	1,660	700	98	1,020	a 461	16
18	83	406	146	700	222	1,140	1,260	1,140	98	1,260	222	332
19	125	371	131	700	178	1,140	1,140	1,020	87	852	178	272
20	90	279	118	652	245	905	1,020	800	66	365	158	178
21	62	226	105	520	198	1,020	1,020	905	56	272	124	2,510
22	90	235	94	700	700	700	800	1,390	98	222	98	1,390
23	105	204	58	750	800	520	700	2,070	141	198	750	562
24	262	190	74	700	520	245	520	4,090	222	198	245	300
25	350	226	.....	700	222	700	365	1,390	272	332	158	198
26	320	204	.....	905	300	1,390	440	2,220	272	272	158	178
27	290	149	.....	800	365	6,110	700	4,000	272	198	198	141
28	90	183	.....	700	440	4,670	905	4,380	198	158	158	124
29	67	131	.....	520	.....	1,660	1,140	2,220	198	178	141	124
30	190	74	.....	605	.....	1,390	1,390	2,440	158	158	111	111
31	172	.....	.....	402	.....	800	.....	2,360	.....	480	98	.....

a Interpolated.

NOTE.—Daily discharge computed from a fairly well defined rating curve. See "Accuracy" in station description.

Discharge estimated, because of ice, from gage heights, observer's notes, and discharge of adjacent drainage areas, as follows: Dec. 3 to 23, 1910, 80 second-feet; Jan. 7 to 19, 1912, 300 second-feet; Feb. 5 to 20, 1912, 100 second-feet; Dec. 25, 1912, to Jan. 1, 1913, 400 second-feet; Feb. 8 to 16, 1913, 400 second-feet. Mean discharge, Oct. 1 to 13, 1910, estimated in order to complete the year ending Sept. 30, 1911, as 100 second-feet. Daily discharge, Nov. 18 to 23, 1911, Mar. 17 to 21, 1912, and July 3 to 6, 1913, estimated because gage was not read. Daily discharge, May 23 and Aug. 7, 1911, obtained by adding 1 foot to reported gage height before entering rating table.

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Monthly discharge of Shavers Fork at Parsons, W. Va., for the years ending Sept. 30, 1911–1913.

[Drainage area, 210 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1911.						
October	.....	.....	95.2	0.453	0.52	C.
November	1,740	58	192	.914	1.02	B.
December	3,420	.....	339	1.61	1.86	D.
January	12,300	155	1,970	9.38	10.81	C.
February	3,140	120	497	2.37	2.47	B.
March	2,300	92	754	3.59	4.14	B.
April	3,980	378	1,570	7.48	8.34	B.
May	912	38	237	1.13	1.30	B.
June	1,120	235	512	2.44	2.72	B.
July	226	34	80.7	.384	.44	C.
August	4,200	16	180	.857	.99	D.
September	4,950	54	706	3.36	3.75	C.
The year	12,300	.....	594	2.83	38.36	
1912.						
October	6,330	190	1,340	6.38	7.36	B.
November	2,670	125	505	2.40	2.68	C.
December	2,060	155	809	3.85	4.44	C.
January	2,510	.....	1,130	5.38	6.20	D.
February	6,330	.....	886	4.22	4.55	C.
March	6,110	1,370	2,420	11.5	13.26	C.
April	2,060	190	680	3.24	3.62	B.
May	5,470	125	1,060	5.05	5.82	B.
June	1,370	.....	339	1.61	1.80	C.
July	7,740	125	1,440	6.86	7.91	B.
August	785	79	186	.886	1.02	B.
September	1,920	.....	288	1.37	1.53	C.
The year	7,740	.....	929	4.42	60.19	
1913.						
October	350	55	133	.633	.73	B.
November	3,900	48	511	2.43	2.71	B.
December	563	.....	254	1.21	1.40	C.
January	4,670	402	1,040	4.95	5.71	B.
February	.....	.....	483	2.30	2.40	C.
March	6,110	245	1,250	5.95	6.86	B.
April	2,510	272	864	4.11	4.59	B.
May	4,380	98	1,150	5.48	6.32	B.
June	1,260	56	308	1.47	1.64	B.
July	2,590	98	626	2.98	3.44	B.
August	4,870	56	415	1.98	2.28	B.
September	2,510	16	267	1.27	1.42	B.
The year	6,110	.....	611	2.91	39.50	

NOTE.—See "Accuracy" in station description and footnote to table of daily discharge.

YOUGHIOGHENY RIVER AT CONFLUENCE, PA.

Location.—At highway bridge, about half a mile from the railroad station at Confluence, Pa., about half a mile above the mouth of Casselman River.

Records available.—September 15, 1904, to September 30, 1913.

Drainage area.—435 square miles.

Gage.—Chain gage attached to bridge; read once daily in the afternoon to half-tenths.

Control.—Probably permanent.

Discharge measurements.—Made from upstream side of bridge.

Winter flow.—Discharge relation occasionally affected by ice.

Accuracy.—Discharge measurements made during 1911 and 1912 indicate marked effect from backwater at this station; estimates of discharge withheld. For a statement of general conditions at this station see Water-Supply Papers 263 and 283.

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Cooperation.—Station maintained by the Water Supply Commission of Pennsylvania, which supplied all records for the year ending September 30, 1913.

Discharge measurements of Youghiogheny River at Confluence, Pa., in the year ending Sept. 30, 1913.

[Hydrographer, R. A. Boehringer, an engineer of the Pennsylvania Water Supply Commission.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
Dec. 4	2.50	414
Aug. 12	a1.93	151

a Measurement made by wading at a section at the bridge.

Daily gage height, in feet, of Youghiogheny River at Confluence, Pa., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3.12	2.16	2.01	4.50	3.30	3.80	3.66	2.66	4.82	2.52	2.02	1.45
2	2.92	2.16	2.06	3.80	3.10	3.40	3.51	2.61	4.42	2.62	2.02	1.40
3	2.77	2.11	2.56	5.90	3.20	3.30	3.71	2.56	3.92	2.57	1.97	1.40
4	2.62	2.11	2.46	4.80	3.80	3.20	3.81	2.51	3.52	2.47	1.92	1.40
5	2.52	2.06	2.41	4.50	3.45	3.10	3.51	2.51	3.32	2.42	1.82	1.35
6	2.42	2.06	3.80	5.00	3.20	3.00	3.26	2.51	3.17	2.37	1.82	1.35
7	2.32	3.61	3.90	8.50	3.00	2.90	3.11	2.51	3.07	2.32	1.82	1.35
8	2.22	5.16	3.40	11.70	3.00	2.85	3.01	2.46	3.42	2.27	1.77	1.40
9	2.12	4.01	3.15	7.70	2.90	2.75	2.91	2.46	3.12	2.27	1.77	1.45
10	2.12	3.31	2.95	5.10	2.90	3.00	2.71	2.41	2.92	2.22	1.72	1.40
11	2.12	3.06	2.70	5.70	3.25	4.05	2.71	2.41	2.72	2.17	1.72	1.40
12	2.12	2.96	2.50	10.00	3.80	3.80	3.01	2.41	2.57	2.17	1.92	1.45
13	2.12	2.86	2.35	6.85	3.50	3.65	3.51	2.51	2.47	2.27	2.52	1.40
14	2.07	2.96	2.35	5.20	3.25	4.50	3.71	2.91	2.37	2.72	2.36	1.40
15	2.07	2.81	2.40	4.40	3.10	4.40	4.46	3.11	2.27	3.02	2.06	1.40
16	2.07	2.71	2.40	4.35	3.00	3.90	4.26	3.41	2.27	3.82	2.01	1.35
17	2.02	2.61	2.40	4.40	2.85	3.60	3.85	3.51	2.22	2.82	1.96	1.35
18	2.02	2.56	2.50	4.50	2.75	3.40	3.56	3.11	2.22	2.72	1.91	1.40
19	2.02	2.46	2.80	4.30	2.65	3.25	3.36	3.01	2.32	2.62	1.91	1.60
20	1.97	2.41	3.00	3.90	2.65	3.15	3.11	2.91	2.27	2.52	1.86	2.00
21	1.97	2.36	2.90	3.95	2.90	3.05	2.96	3.31	2.27	2.42	1.81	2.20
22	1.97	2.31	2.80	3.70	3.40	3.00	2.91	4.01	2.22	2.37	1.76	2.35
23	2.32	2.26	2.85	3.60	3.30	3.00	2.81	7.06	2.22	2.32	1.71	2.20
24	2.72	2.21	2.50	4.65	3.20	2.95	2.76	8.21	2.22	2.27	1.66	2.00
25	2.72	2.16	2.25	4.70	3.10	3.00	2.76	5.31	2.22	2.52	1.61	1.90
26	2.82	2.11	2.00	4.25	3.00	4.70	2.71	4.21	2.17	2.42	1.56	1.80
27	2.67	2.11	2.10	3.95	3.00	6.75	2.66	7.71	2.82	2.32	1.51	1.65
28	2.52	2.06	2.40	3.70	4.75	5.50	2.61	6.41	2.72	2.22	1.51	1.55
29	2.37	2.01	2.65	3.50	.....	4.45	2.61	5.61	2.62	2.17	1.46	1.45
30	2.27	2.01	4.50	3.30	.....	3.95	2.71	5.01	2.52	2.12	1.46	1.65
31	2.17	.....	5.70	3.50	.....	3.80	.....	5.21	.....	2.07	1.46	.....

NOTE.—On Dec. 14, 1912, ice formed along the shores. Discharge relation probably not affected by ice during the year ending Sept. 30, 1913.

CASSELMAN RIVER AT MARKLETON, PA.

Location.—At highway bridge at the Baltimore & Ohio Railroad station at Markleton, Pa.

Records available.—August 25 to September 30, 1913.

Drainage area.—365 square miles (Water Supply Commission of Pennsylvania).

Gage.—Chain gage attached to bridge; read daily morning and evening to hundredths.

Control.—Bed consists of gravel and bowlders.

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Discharge measurements.—Made from downstream side of bridge.
Winter flow.—Discharge relation affected by ice during short periods.
Accuracy.—Data insufficient for estimates of discharge.
Cooperation.—Station established and records furnished by Water Supply Commission of Pennsylvania.

The following discharge measurement was made by R. A. Boehringer, an engineer of the Water Supply Commission of Pennsylvania:

August 13, 1913: Gage height, 2.80 feet; discharge, 235 second-feet.

Daily gage height, in feet, of Casselman River at Markleton, Pa., for the year ending Sept. 30, 1913.

Day.	Aug.	Sept.	Day.	Aug.	Sept.	Day.	Aug.	Sept.
1		1.90	11		1.90	21		1.90
2		1.90	12		1.90	22		2.01
3		1.90	13		1.90	23		2.00
4		1.90	14		1.90	24		2.00
5		1.90	15		1.91	25	2.06	2.00
6		1.90	16		1.90	26	2.00	2.92
7		1.90	17		1.90	27	2.00	2.90
8		2.90	18		1.90	28	1.90	2.90
9		2.00	19		1.90	29	1.95	2.45
10		2.00	20		1.90	30	1.95	2.46
						31	2.00	

CASSELMAN RIVER AT CONFLUENCE, PA.

Location.—At highway bridge, about 500 yards from the railroad station and a few hundred yards above the junction of Casselman and Youghiogheny rivers.
Records available.—September 15, 1904, to August 11, 1913, when station was discontinued. See station at Markleton, Pa., established August 13, 1913.
Drainage area.—450 square miles.
Gage.—Chain gage attached to bridge; read once daily in the afternoon to half-tenths.
Control.—Probably permanent.
Discharge measurements.—Made from upstream side of bridge.
Winter flow.—Discharge relation is affected by ice at times.
Accuracy.—Estimates of discharge for the year ending September 30, 1913, are withheld. This station was located only a few hundred yards above the junction of Casselman and Youghiogheny rivers and backwater usually occurred at high stages. For discussion of the general conditions at this station, because of which it was discontinued, see Water-Supply Papers 263 and 283.
Cooperation.—Station maintained by the Water Supply Commission of Pennsylvania, which furnished all records for year ending September 30, 1913.

The following discharge measurement was made by R. A. Boehringer, an engineer of the Water Supply Commission of Pennsylvania:

December 4, 1912: Gage height, 2.48 feet; discharge, 429 second-feet.

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Daily gage height, in feet, of Casselman River at Confluence, Pa., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.
1	3.80	2.20	2.10	3.63	2.77	3.46	3.20	2.49	3.63	2.27	1.81
2	3.50	2.20	2.20	3.08	2.57	3.06	3.05	2.49	3.33	2.17	1.76
3	3.10	2.15	2.60	5.28	2.72	2.86	4.05	2.34	3.13	2.07	1.66
4	2.90	2.15	2.40	4.08	2.77	2.76	3.75	2.29	2.93	1.97	1.61
5	2.70	2.15	2.40	3.78	2.57	2.81	3.45	2.24	2.78	1.87	1.61
6	2.60	2.10	3.25	4.18	2.37	2.71	3.20	2.24	2.68	1.77	1.61
7	2.50	4.10	3.10	7.73	2.22	2.61	2.95	2.24	2.63	1.72	1.56
8	2.40	4.35	2.80	11.68	2.22	2.51	2.90	2.24	2.83	1.72	1.56
9	2.30	3.40	2.55	6.88	2.17	2.46	2.85	2.19	2.73	1.72	1.56
10	2.30	3.20	2.40	4.53	2.12	2.81	2.75	2.19	2.63	1.72	1.71
11	2.30	3.00	2.30	5.28	2.67	3.81	2.80	2.14	2.53	1.62	1.91
12	2.25	2.80	2.20	9.48	2.77	3.61	3.00	2.14	2.43	1.72	.....
13	2.25	2.70	2.15	5.83	2.57	3.46	3.45	2.19	2.33	2.02	.....
14	2.20	2.90	2.25	4.38	2.57	4.06	3.70	2.34	2.28	2.52	.....
15	2.20	2.75	2.40	3.68	2.52	3.76	4.40	2.44	2.23	2.52	.....
16	2.15	2.65	2.40	3.68	2.47	3.46	4.15	2.64	2.23	2.42	.....
17	2.15	2.60	2.35	3.98	2.47	3.16	3.65	2.94	2.18	2.22	.....
18	2.10	2.55	2.35	4.08	2.42	2.96	3.45	2.64	2.18	2.17	.....
19	2.10	2.50	2.65	3.83	2.37	2.96	3.20	2.54	2.33	2.17	.....
20	2.05	2.45	2.60	3.48	2.37	2.96	2.95	2.49	2.28	2.12	.....
21	2.05	2.40	2.40	3.53	2.47	2.86	2.80	2.84	2.23	2.12	.....
22	2.05	2.35	2.25	3.23	2.97	2.86	2.75	4.14	2.18	2.07	.....
23	3.20	2.25	2.15	3.23	2.82	2.81	2.70	6.04	2.18	2.07	.....
24	2.75	2.25	2.10	4.23	2.67	2.81	2.65	6.84	2.18	2.02	.....
25	2.70	2.20	2.10	3.83	2.57	2.76	2.60	4.44	2.18	2.17	.....
26	2.60	2.20	2.20	3.48	2.47	3.81	2.60	3.94	2.13	2.12	.....
27	2.55	2.15	2.20	3.28	2.57	6.66	2.55	7.44	2.68	2.07	.....
28	2.45	2.15	2.30	3.08	4.47	4.81	2.50	5.59	2.58	2.02	.....
29	2.35	2.10	2.35	2.93	.....	3.86	2.45	4.64	2.48	1.97	.....
30	2.25	2.10	3.35	2.78	.....	3.41	2.55	3.84	2.38	1.92	.....
31	2.20	.....	4.70	2.98	.....	3.31	.....	4.04	.....	1.92	.....

NOTE.—On Dec. 14, 1912, ice was present along the shores.

LAUREL HILL CREEK AT URSINA, PA.

Location.—At highway bridge at Ursina, Pa., 2 miles above Confluence.

Records available.—August 15 to September 30, 1913.

Drainage area.—122 square miles (Water Supply Commission of Pennsylvania).

Gage.—Chain gage attached to bridge; read daily morning and evening to half-tenths.

Control.—Bed at measuring section consists of gravel.

Discharge measurements.—Made from downstream side of bridge, or, at low water, by wading.

Winter flow.—Ice may affect the discharge relation during short periods.

Accuracy.—Data insufficient for estimates of discharge.

Cooperation.—Station established and data furnished by the Water Supply Commission of Pennsylvania.

The following discharge measurement was made by R. A. Boehringer, an engineer of the Water Supply Commission of Pennsylvania:

August 12, 1913: Gage height, 2.04 feet; discharge, 81 second-feet.

Daily gage height, in feet, of Laurel Hill Creek at Ursina, Pa., for the year ending Sept. 30, 1913.

Day.	Aug.	Sept.	Day.	Aug.	Sept.	Day.	Aug.	Sept.
1	.....	1.60	11	.....	1.60	21	1.60	2.02
2	.....	1.58	12	.....	1.60	22	1.60	2.05
3	.....	1.50	13	.....	1.60	23	1.68	1.88
4	.....	1.51	14	.....	1.60	24	1.80	1.72
5	.....	1.50	15	1.72	1.58	25	1.68	1.70
6	.....	1.50	16	1.70	1.51	26	1.60	1.68
7	.....	1.51	17	1.70	1.56	27	1.60	1.65
8	.....	1.65	18	1.68	1.72	28	1.60	1.68
9	.....	1.70	19	1.65	1.90	29	1.60	1.65
10	.....	1.68	20	1.62	1.80	30	1.60	1.60
						31	1.60	.....

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LAUREL HILL CREEK AT CONFLUENCE, PA.

Location.—At highway bridge, about one-fourth mile from the railroad station and only a few hundred yards above the junction of the creek with Youghiogheny River.

Records available.—September 15, 1904, to August 11, 1913, when station was discontinued. Replaced by station established at Ursina, Pa., August 12, 1913.

Drainage area.—126 square miles.

Gage.—Chain gage attached to bridge read once daily in the afternoon to half-tenths.

Control.—Bed at measuring section shifts as result of refuse dumped into the creek from a tannery a short distance above the bridge.

Discharge measurements.—Made from the downstream side of the bridge.

Winter flow.—Ice may affect discharge relation during short periods.

Accuracy.—Discharge relation is affected by backwater from the Youghiogheny and by shift of channel at bridge. Estimates of discharge for the year ending September 30, 1913, are withheld. This station was located only a few hundred yards above the junction of the creek with Youghiogheny River, and as a result backwater was present at high stages. For a discussion of general conditions at this station, because of which it was discontinued, see Water Supply Papers 263 and 283.

Cooperation.—Station maintained by the Water Supply Commission of Pennsylvania, which furnished the records for the year ending September 30, 1913.

The following discharge measurements were made by R. A. Boehringer, an engineer of the Water Supply Commission of Pennsylvania:

December 4, 1912: Gage height, 2.17 feet; discharge, 147 second-feet.

Daily gage height, in feet, of Laurel Hill Creek at Confluence, Pa., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.
1	2.88	2.27	1.87	3.21	2.61	3.22	2.93	2.28	2.99	2.00	1.66
2	2.68	2.27	1.97	2.81	2.51	3.02	2.88	2.23	2.74	1.90	1.61
3	2.53	2.22	2.32	4.01	2.66	2.97	3.68	2.23	2.64	1.85	1.61
4	2.43	2.17	2.02	3.66	2.61	2.92	3.23	2.18	2.49	1.80	1.56
5	2.38	2.12	2.20	3.46	2.51	2.82	2.93	2.18	2.49	1.75	1.56
6	2.28	2.12	3.00	3.76	2.36	2.72	2.73	2.18	2.64	1.70	1.56
7	2.23	3.27	2.80	6.11	2.26	2.62	2.58	2.18	2.74	1.65	1.56
8	2.13	3.47	2.55	9.76	2.21	2.57	2.53	2.18	2.84	1.65	1.56
9	2.03	2.82	2.40	5.01	2.21	2.52	2.48	2.18	2.64	1.65	1.56
10	2.03	2.72	2.30	3.66	2.16	2.77	2.43	2.13	2.44	1.65	1.56
11	2.03	2.62	2.15	4.01	2.76	3.47	2.53	2.13	2.34	1.65	1.66
12	2.03	2.52	2.05	7.41	2.76	3.22	2.83	2.18	2.24	1.65	.....
13	2.03	2.42	1.95	4.46	2.41	3.07	3.23	2.23	2.09	1.65	.....
14	1.98	2.57	2.15	3.51	2.41	3.32	3.13	2.38	1.99	2.30	.....
15	1.98	2.42	2.30	3.11	2.41	3.02	3.58	2.43	1.89	2.45	.....
16	1.98	2.32	2.20	3.11	2.41	2.92	3.38	3.13	1.89	2.35	.....
17	1.93	2.27	2.10	3.41	2.41	2.92	3.08	2.93	1.89	2.20	.....
18	1.93	2.22	2.10	3.51	2.36	2.87	2.88	2.48	1.89	2.15	.....
19	1.88	2.22	2.60	3.31	2.36	2.82	2.68	2.43	2.04	2.15	.....
20	1.88	2.17	2.40	3.11	2.41	2.82	2.58	2.43	1.99	2.05	.....
21	1.83	2.12	2.25	3.16	2.61	2.82	2.48	2.63	1.99	2.00	.....
22	1.83	2.12	2.15	2.91	3.11	2.77	2.43	3.03	1.94	2.00	.....
23	3.23	2.07	2.05	3.01	2.96	2.77	2.43	4.38	1.94	1.95	.....
24	2.93	2.07	2.05	4.06	2.86	2.77	2.38	3.73	1.94	1.90	.....
25	2.88	2.02	2.00	3.51	2.71	2.72	2.38	3.33	1.89	2.05	.....
26	2.83	2.02	2.00	3.21	2.61	4.17	2.33	3.13	1.89	1.95	.....
27	2.73	1.97	2.00	3.01	2.61	5.22	2.33	5.08	2.29	1.85	.....
28	2.63	1.92	2.05	2.81	3.71	3.92	2.28	4.03	2.19	1.80	.....
29	2.53	1.92	2.20	2.66	.....	3.42	2.23	3.53	2.14	1.75	.....
30	2.43	1.92	4.25	2.56	.....	3.12	2.33	3.28	2.09	1.70	.....
31	2.33	.....	3.55	2.76	.....	3.02	.....	3.43	.....	1.70	.....

NOTE.—Ice present along the shores Dec. 14, 1912.

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MOHICAN RIVER BASIN.

MOHICAN RIVER AT POMERENE, OHIO.

Location.—At highway bridge at Pomerene, Ohio, 4 miles from Walhonding, Ohio, and 5 miles below the mouth of Owl Creek.

Records available.—December 1, 1910, to March 31, 1913, when station was discontinued.

Drainage area.—Not measured.

Gage.—Standard chain gage attached to bridge; read daily, morning and evening, to hundredths. Limits of use: Hundredths below 3.5, half-tenths from 3.5 to 4.5, tenths above 4.5 feet.

Control.—Apparently permanent. Bed consists of coarse gravel.

Discharge measurements.—Made from upstream side of bridge.

Winter flow.—Discharge relation sometimes affected by ice cover and by ice gorges during the winter months.

Diversions.—A feeder for the Ohio Canal formerly took water from the river at Cavallo, some distance above Pomerene, but this feeder has not been in use for some time.

Accuracy.—Data insufficient for estimates of discharge.

No discharge measurements were made at this station during the year ending September 30, 1913.

Daily gage height, in feet, of Mohican River at Pomerene, Ohio, for the year ending Sept. 30, 1913.

[F. L. Rodehaver, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
1	3.47	3.65	2.83	3.55	6.1	4.1	16	2.88	3.38	3.39	7.4	3.75	3.95
2	3.41	4.0	3.34	3.21	5.6	3.95	17	2.86	3.21	3.37	12.6	3.85	3.85
3	3.16	3.85	3.85	3.37	4.7	3.85	18	2.86	3.12	3.33	11.5	3.85	3.75
4	3.02	3.8	3.85	3.42	3.95	4.2	19	3.47	3.09	3.31	9.6	3.85	3.65
5	2.97	3.75	3.85	3.25	3.7	4.9	20	3.45	3.06	3.25	8.6	3.95	3.65
6	2.95	3.65	4.35	4.2	3.47	4.2	21	3.41	3.03	3.15	8.9	4.25	3.8
7	2.96	4.05	4.8	7.1	3.43	3.95	22	3.27	2.97	3.11	8.2	4.35	3.95
8	2.98	3.95	4.6	9.7	4.6	3.95	23	3.22	2.96	3.30	8.8	4.05	3.85
9	3.25	3.85	4.15	8.3	4.1	3.85	24	4.8	2.94	3.31	10.4	3.85	6.5
10	3.26	3.85	3.75	7.8	3.9	3.85	25	4.8	2.92	3.28	8.3	3.8	23.5
11	3.21	3.8	3.6	10.5	3.45	4.15	26	4.8	2.90	3.25	7.0	3.85	.....
12	3.22	3.75	3.55	12.4	3.42	4.25	27	4.6	2.90	3.20	6.6	4.2	.....
13	3.20	3.65	3.55	9.9	3.40	4.2	28	4.2	2.88	3.17	6.5	5.0	a18
14	3.19	3.65	3.47	8.4	3.40	4.1	29	3.85	2.87	3.13	6.4	.....	a15.5
15	2.93	3.6	3.43	7.3	3.40	4.4	30	3.65	2.86	3.39	6.3	.....	a13.5
							31	3.46	.....		4.4	5.9	.....	a13

a Gage heights estimated by observer; bridge and gage washed away.

NOTE.—On Feb. 8 observer reported backwater from ice; river frozen over Feb. 9–15. Discharge relation probably affected by ice about Feb. 8–19.

KANAWHA RIVER BASIN.

SOUTH FORK OF NEW RIVER NEAR CRUMPLER, N. C.

Location.—About 1.6 miles above the confluence of North and South forks of New River and about 4 miles from Crumpler, N. C.

Records available.—August 12, 1908, to September 30, 1913.

Drainage area.—325 square miles.

Gage.—Standard chain gage attached to trees on left bank; read daily morning and evening to hundredths. Limits of use: Hundredths below 1.5, half-tenths from 1.5 to 2.5, and tenths above 2.5 feet.

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Control.—Practically permanent.

Discharge measurements.—Made from a boat at a section about half a mile below the gage or by wading at a section about 500 feet below the gage.

Winter flow.—Ice rarely forms in sufficient quantity to affect gage readings.

Accuracy.—Gage-height record considered very reliable. Data insufficient for estimates of discharge. Station not visited by Survey engineers during the year ending September 30, 1913. Station was visited December 16, 1913, and the elevations of bench marks and zero of gage were checked with a wye level and a discharge measurement was made.

Daily gage height, in feet, of South Fork of New River near Crumpler, N. C., for the year ending Sept. 30, 1913.

[J. J. Garvey, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.35	1.17	1.28	1.5	1.45	1.8	2.1	1.7	1.81	1.38	1.28	1.20
2	1.31	1.20	1.30	1.30	1.41	1.65	2.0	1.7	1.75	1.5	1.30	1.20
3	1.28	1.18	1.30	1.34	1.36	1.5	1.95	1.65	1.85	1.48	1.28	1.18
4	1.24	1.16	1.28	1.65	1.5	1.46	1.9	1.6	2.0	1.8	1.25	1.7
5	1.22	1.15	1.32	1.41	1.43	1.42	1.8	1.6	1.8	1.6	1.20	2.6
6	1.20	1.14	1.38	1.42	1.37	1.38	1.8	1.6	1.75	1.48	1.95	1.9
7	1.20	1.95	1.44	1.40	1.32	1.32	1.75	1.6	1.7	1.36	1.34	1.5
8	1.18	2.25	1.35	1.41	1.25	1.32	1.75	1.8	1.8	1.30	1.48	1.40
9	1.18	1.65	1.28	1.34	1.34	1.34	1.8	1.8	2.0	1.30	1.46	1.37
10	1.15	1.45	1.25	1.30	1.40	1.44	1.7	1.6	1.75	1.28	1.42	1.36
11	1.14	1.36	1.21	1.29	1.35	1.55	2.35	1.6	1.65	1.29	1.38	1.32
12	1.14	1.32	1.18	1.30	1.34	1.48	3.1	1.55	1.75	1.38	1.30	1.28
13	1.14	1.30	1.31	1.40	1.38	1.44	3.6	1.55	1.75	1.36	1.48	1.26
14	1.29	1.39	1.28	1.31	1.26	3.6	2.6	1.5	1.6	1.32	1.5	1.25
15	1.40	1.34	1.22	1.28	1.26	3.9	2.45	1.55	1.6	1.30	1.42	1.24
16	1.36	1.30	1.34	1.21	1.26	3.2	2.45	1.7	1.55	1.28	1.36	1.41
17	1.26	1.26	1.24	1.25	1.29	2.4	2.25	1.9	1.49	1.26	1.28	1.65
18	1.18	1.22	1.20	1.26	1.26	2.05	2.1	1.9	1.49	1.24	1.36	1.6
19	1.22	1.21	1.22	1.30	1.20	1.95	2.05	1.7	1.55	1.22	1.40	1.6
20	1.25	1.20	1.21	1.28	1.34	1.8	1.95	1.7	1.65	1.22	1.71	2.05
21	1.24	1.18	1.19	1.24	1.55	1.95	1.9	1.75	1.65	1.20	1.68	3.4
22	1.30	1.18	1.19	1.23	1.6	2.1	1.85	2.0	1.5	1.18	1.56	2.5
23	1.37	1.18	1.24	1.22	1.48	1.85	1.8	2.4	1.48	1.22	1.52	1.9
24	1.34	1.18	1.25	1.24	1.40	1.8	1.8	4.0	1.8	1.26	1.45	1.6
25	1.26	1.18	1.20	1.33	1.32	1.75	1.8	2.8	1.48	1.28	1.40	1.55
26	1.20	1.18	1.38	1.37	1.30	2.2	1.75	2.1	1.55	1.32	1.34	1.5
27	1.18	1.14	1.5	1.75	1.6	6.1	1.85	2.4	1.46	1.34	1.26	1.47
28	1.15	1.24	1.38	2.0	2.0	3.9	1.8	2.6	1.44	1.38	1.21	1.44
29	1.15	1.42	1.40	1.75	.....	2.8	1.75	2.15	1.41	1.40	1.19	1.44
30	1.15	1.37	1.7	1.55	.....	2.4	1.7	1.95	1.38	1.39	1.47	1.6
31	1.14	.....	1.7	1.48	.....	2.3	.....	1.9	.....	1.34	1.20	.....

NOTE.—Discharge relation probably affected by ice about Feb. 9–17, 1913. Observer reported mush ice Dec. 28, 1912, and Feb. 9, 1913.

NEW RIVER AT RADFORD, VA.

Location.—At toll highway bridge near the Norfolk & Western Railway station at Radford, Va., 1½ miles below the Norfolk & Western Railway bridge and 6 miles below the mouth of Little River.

Records available.—August 1, 1898, to July 15, 1906; May 6, 1907, to September 30, 1913.

Drainage area.—2,720 square miles.

Gage.—Standard chain gage attached to bridge; read daily, morning and evening, to hundredths. Limits of use: Hundredths below 3.5, half-tenths from 3.5 to 4.5, and tenths above 4.5 feet. The United States Weather Bureau gage was originally used at this point, but owing to its inaccessibility it was replaced by a wire gage referred to the same datum February 23, 1900. On December 1, 1903, the wire gage was replaced by a chain gage and the datum lowered 3.41 feet to avoid negative readings.

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Control.—Practically permanent.

Discharge measurements.—Made from the downstream side of the highway bridge.

Floods.—Maximum gage height, according to United States Weather Bureau, was 37.4 feet September 15, 1879.

Point of zero flow.—A determination by leveling July 17, 1911, indicates that there would be no flow past the gage if the river stage were to fall to 1.0 foot ± 0.3 foot.

Winter flow.—Discharge relation only occasionally affected by ice.

Regulation.—Power plants about 50 miles above station may affect flow to a small extent.

Discharge measurements of New River at Radford, Va., in the year ending Sept. 30, 1913.

[Hydrographers, Jackson and Wallace.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Mar. 28	10.71	30,800	Mar. 29	7.24	15,100
28	10.01	27,600	29	6.83	13,200

Daily gage height, in feet, of New River at Radford, Va., for the year ending Sept. 30, 1913.

[J. H. Lucas and R. B. Harvey, observers.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3.6	3.34	3.34	4.2	4.15	5.4	5.1	4.0	4.8	3.75	3.46	3.65
2	3.55	3.34	3.20	3.95	4.05	5.3	4.8	3.95	4.5	3.7	3.43	3.5
3	3.55	3.38	3.65	3.9	4.0	4.3	4.6	3.9	4.3	4.6	3.43	3.55
4	3.55	3.12	3.6	3.9	4.05	4.05	4.5	3.9	5.2	4.8	3.23	3.9
5	3.40	3.45	3.6	3.95	4.15	3.95	4.4	3.9	4.5	4.9	3.24	4.1
6	3.38	3.37	3.85	3.9	4.2	3.9	4.25	3.9	4.35	4.3	3.28	4.1
7	3.38	3.5	3.7	4.0	3.9	3.7	4.2	3.9	4.2	3.95	3.27	4.0
8	3.47	4.5	3.65	3.9	3.5	3.65	4.2	3.85	4.3	3.75	3.55	3.7
9	3.42	4.35	3.6	3.8	3.5	3.7	4.15	3.9	4.4	3.7	3.46	3.7
10	3.36	4.05	3.55	3.65	3.6	3.7	4.1	3.85	4.4	3.6	3.44	3.6
11	3.28	3.7	3.46	3.7	3.85	4.0	4.2	3.8	4.2	3.65	3.65	3.55
12	3.29	3.65	3.42	3.75	3.75	4.0	5.8	3.8	4.3	4.0	3.7	3.5
13	3.28	3.6	3.5	3.8	3.75	4.0	8.6	3.75	4.15	3.7	4.0	3.45
14	3.41	3.55	3.55	3.8	3.5	7.9	7.2	3.75	4.1	3.6	3.7	3.42
15	3.6	3.65	3.55	3.7	3.55	9.8	5.9	3.7	3.95	3.7	3.7	3.27
16	3.6	3.7	3.26	3.7	3.5	9.0	5.5	3.85	3.9	3.65	3.6	3.55
17	3.42	3.55	3.55	3.6	3.6	6.6	5.4	4.15	3.85	3.6	3.55	3.55
18	3.42	3.28	3.55	3.6	3.49	5.2	5.1	4.4	3.8	3.6	3.32	3.55
19	3.5	3.6	3.49	3.55	3.65	5.0	4.8	4.2	3.75	3.55	3.8	3.49
20	3.42	3.6	3.36	3.5	3.9	4.8	4.6	4.0	3.8	3.42	3.8	3.6
21	3.18	3.48	3.42	3.55	3.75	4.5	4.3	4.0	3.75	3.49	4.0	5.9
22	3.5	3.30	3.47	3.55	3.9	4.7	4.4	4.3	3.75	3.55	3.85	6.0
23	3.49	3.32	3.28	3.65	3.9	4.6	4.3	7.1	4.05	3.5	3.7	4.8
24	3.38	3.38	3.55	3.49	3.85	4.4	4.25	10.0	4.1	3.43	3.65	4.2
25	3.49	3.38	3.28	3.5	3.8	4.3	4.15	7.3	4.15	3.55	3.75	4.15
26	3.45	3.38	3.20	3.6	3.65	4.45	4.1	5.6	4.45	3.34	3.6	3.8
27	3.45	3.55	3.20	3.95	3.95	12.3	4.15	5.6	4.1	3.20	3.55	3.5
28	3.36	3.40	3.31	5.1	5.1	11.3	4.25	6.8	4.0	3.24	3.5	3.5
29	3.38	3.32	3.6	5.5	.....	7.2	4.15	6.0	3.8	3.34	3.46	3.29
30	3.42	3.44	3.39	5.1	.....	6.0	4.0	5.3	3.8	3.35	3.65	3.5
31	3.41	.....	3.8	4.6	.....	5.6	.....	5.2	.....	3.45	3.7	.....

NOTE.—Observer made no notes concerning ice. Discharge relation probably not affected by ice during year ending Sept. 30, 1913.

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Daily discharge, in second-feet, of New River at Radford, Va., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,080	1,450	1,450	3,890	3,720	8,350	6,640	3,060	5,610	2,370	1,660	2,120
2	1,950	1,450	1,150	3,080	3,400	7,950	5,610	2,920	4,610	2,240	1,590	1,750
3	1,950	1,540	2,220	2,930	3,240	4,230	4,940	2,780	3,970	4,940	1,590	1,870
4	1,950	998	2,080	2,930	3,400	3,400	4,610	2,780	7,000	5,610	1,160	2,780
5	1,580	1,700	2,080	3,080	3,720	3,080	4,280	2,780	4,610	5,950	1,180	3,360
6	1,540	1,510	2,780	2,930	3,890	2,930	3,820	2,780	4,130	3,970	1,260	3,360
7	1,540	1,820	2,350	3,240	2,930	2,350	3,660	2,780	3,660	2,920	1,240	3,060
8	1,750	4,930	2,220	2,930	1,820	2,220	3,660	2,640	3,970	2,370	1,870	2,240
9	1,630	4,400	2,080	2,630	1,820	2,350	3,510	2,780	4,280	2,240	1,660	2,240
10	1,490	3,400	1,950	2,220	2,080	2,350	3,360	2,640	4,280	1,990	1,610	1,990
11	1,320	2,350	1,720	2,350	2,780	3,240	3,660	2,500	3,660	2,120	2,120	1,870
12	1,340	2,220	1,630	2,490	2,490	3,240	9,230	2,500	3,970	3,060	2,240	1,750
13	1,320	2,080	1,820	2,630	2,490	3,240	21,000	2,370	3,510	2,240	3,060	1,640
14	1,600	1,950	1,950	2,630	1,820	19,200	14,800	2,370	3,360	1,990	2,240	1,570
15	2,080	2,220	1,950	2,350	1,950	28,300	9,620	2,240	2,920	2,240	2,240	1,240
16	2,080	2,350	1,280	2,350	1,820	24,400	8,100	2,640	2,780	2,120	1,990	1,870
17	1,630	1,950	1,950	2,080	2,080	13,400	7,720	3,510	2,640	1,990	1,870	1,870
18	1,630	1,320	1,950	2,080	1,800	7,560	6,640	4,280	2,500	1,990	1,340	1,870
19	1,820	2,080	1,800	1,950	2,220	6,780	5,610	3,660	2,370	1,870	2,500	1,730
20	1,630	2,080	1,490	1,820	2,930	6,020	4,940	3,060	2,500	1,570	2,500	1,990
21	1,110	1,770	1,630	1,950	2,490	4,930	3,970	3,060	2,370	1,730	3,060	9,620
22	1,820	1,360	1,750	1,950	2,930	5,650	4,280	3,970	2,370	1,870	2,640	10,000
23	1,800	1,400	1,320	2,220	2,930	5,290	3,970	14,400	3,210	1,750	2,240	5,610
24	1,540	1,540	1,950	1,800	2,780	4,580	3,820	27,500	3,360	1,590	2,120	3,660
25	1,800	1,540	1,320	1,820	2,630	4,230	3,510	15,300	3,510	1,870	2,370	3,510
26	1,700	1,540	1,150	2,080	2,220	4,760	3,360	8,470	4,450	1,390	1,990	2,500
27	1,700	1,950	1,150	3,080	3,080	38,400	3,510	8,470	3,360	1,100	1,870	1,750
28	1,490	1,580	1,380	7,170	7,170	33,600	3,820	13,200	3,060	1,180	1,750	1,750
29	1,540	1,400	2,080	8,750	.....	14,800	3,510	10,000	2,500	1,390	1,660	1,280
30	1,630	1,680	1,560	7,170	.....	10,000	3,060	7,360	2,500	1,410	2,120	1,750
31	1,600	.....	2,630	5,290	.....	8,470	.....	7,000	.....	1,640	2,240	.....

NOTE.—Daily discharge computed from a well-defined rating curve. New rating curve used, beginning Mar. 27, 1913, differs from the previous curve 5 to 7 per cent, the greatest difference being at high stage.

Monthly discharge of New River at Radford, Va., for the year ending Sept. 30, 1913.

[Drainage area, 2,720 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	2,080	1,110	1,670	0.614	0.71	B.
November	4,930	998	1,990	.732	.82	B.
December	2,780	1,150	1,800	.662	.76	B.
January	8,750	1,800	3,090	1.14	1.31	B.
February	7,170	1,800	2,810	1.03	1.07	B.
March	38,400	2,220	9,330	3.43	3.95	B.
April	21,000	3,060	5,740	2.11	2.35	A.
May	27,500	2,240	5,670	2.08	2.40	A.
June	7,000	2,370	3,570	1.31	1.46	A.
July	5,950	1,100	2,350	.864	1.00	A.
August	3,060	1,160	1,970	.724	.83	B.
September	10,000	1,280	2,790	1.03	1.15	A.
The year	38,400	998	3,570	1.31	17.81	

NEW RIVER AT FAYETTE, W. VA.

Location.—At highway bridge connecting Fayette and South Fayette, W. Va., 850 feet above the mouth of Wolf Creek.

Records available.—July 29, 1895, to May 22, 1901; August 11, 1902, to December 31, 1904; July 16, 1908, to September 30, 1913.

Drainage area.—6,800 square miles.

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Gage.—Standard chain gage attached to bridge; gage read daily, morning and evening, to hundredths. Limits of use: Half-tenths below 0.0 and tenths above 0.0. Elevation of the zero of the gage, 838.44 feet above sea level.

Control.—Bed composed of rock strewn with large bowlders, which cause boils and eddies at high stages.

Discharge measurements.—Made from upstream side of bridge.

Floods.—The flood of 1878 reached a height of about 53 feet referred to the gage datum.

Winter flow.—Discharge relation little, if at all, affected by ice.

Accuracy.—Errors entered into many of the gage readings prior to 1908, particularly before the chain gage was installed, November 20, 1903, the original wire gage being frequently many tenths in error. Owing to this cause and to the difficulty in making accurate measurements all estimates of discharge heretofore published are only fair. Estimates of discharge for the year ending September 30, 1913, are withheld for the present.

Discharge measurements of New River at Fayette, W. Va., in the year ending Sept. 30, 1913.

Date.	Hydrographer.	Gage height.	Discharge.
1913.		*Feet.*	*Sec.-ft.*
Mar. 28	A. H. Horton	[a] 33.2	[b] 147,000
June 19	H. J. Jackson	3.10	4,690

[a] ± 0.5 foot.
[b] Velocities for this measurement determined by means of surface floats. A coefficient of 0.85 was used o reduce the observed velocities to mean velocities.

Daily gage height, in feet, of New River at Fayette, W. Va., for the year ending Sept. 30, 1913.

[C. J. Henry, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.5	0.7	0.8	3.0	8.9	8.4	8.9	4.5	9.6	2.3	1.0	1.2
2	2.2	.5	.9	9.4	9.4	8.7	6.3	3.8	7.6	2.7	.9	1.6
3	1.6	.5	1.0	7.4	9.3	7.6	5.8	4.0	6.4	3.0	.8	1.5
4	1.5	.5	1.0	6.9	9.0	5.9	5.0	3.9	6.2	3.1	.7	1.4
5	1.4	.6	1.7	8.2	8.8	6.0	4.8	3.7	9.0	3.1	.6	1.1
6	1.3	.6	2.0	7.9	8.3	5.9	4.9	3.5	6.8	3.1	.5	1.1
7	1.4	1.3	2.7	11.4	8.2	5.1	4.7	3.7	6.1	3.1	.5	1.1
8	1.4	3.4	3.2	17.9	7.9	4.7	4.6	3.6	6.5	3.0	.7	1.2
9	1.3	8.0	3.6	11.8	7.5	4.8	4.4	3.5	7.7	2.8	1.1	1.2
10	1.2	5.6	3.1	9.8	3.9	4.9	3.7	3.0	6.8	2.8	1.1	1.3
11	1.1	4.5	2.9	9.1	3.2	4.2	4.2	3.7	5.9	2.8	1.1	1.3
12	1.0	4.0	2.2	9.8	3.1	6.0	4.2	2.6	5.5	2.9	1.1	1.1
13	.9	2.8	2.0	6.8	3.1	6.7	13.0	2.8	4.6	3.0	1.2	1.0
14	.5	3.2	1.9	6.6	3.0	7.5	17.4	2.7	4.6	3.0	1.2	.6
15	.4	2.4	1.6	6.1	3.0	15.0	14.2	2.6	4.5	3.0	1.2	1.1
16	.5	1.9	1.5	5.3	2.7	17.2	13.6	2.7	3.3	3.0	1.1	1.1
17	.5	1.9	1.2	4.6	2.8	10.7	11.6	2.7	4.2	2.8	1.1	1.0
18	.5	1.7	1.2	4.1	2.7	8.6	9.7	3.4	3.5	2.6	1.1	1.1
19	.6	1.4	1.4	4.3	2.4	7.4	8.1	4.1	3.1	2.3	1.1	1.5
20	.8	1.4	1.4	4.1	2.2	7.0	6.8	3.9	2.9	2.2	1.1	1.6
21	.8	1.4	1.3	3.7	2.5	7.3	6.5	4.2	2.9	2.2	1.2	1.5
22	1.1	1.4	1.2	3.3	2.8	7.5	5.7	4.8	2.9	2.2	1.1	3.4
23	1.4	1.2	1.3	2.8	2.9	7.4	5.3	5.1	2.6	2.2	1.1	7.0
24	1.6	1.2	1.2	5.0	3.1	5.1	5.0	11.8	2.5	2.2	1.1	6.3
25	1.5	.9	1.2	4.8	2.9	4.7	4.7	16.3	3.0	1.9	1.1	4.7
26	1.3	.9	1.3	4.2	2.9	4.9	4.5	11.5	3.7	1.9	1.1	4.1
27	1.0	1.0	1.3	5.4	2.4	19.7	4.6	10.1	3.5	1.8	1.1	4.0
28	.8	1.0	1.5	8.2	5.4	31.0	4.7	13.7	3.8	1.7	1.1	4.2
29	.8	.9	2.0	9.6	.....	20.5	4.7	14.3	3.3	1.1	1.1	4.2
30	.8	.9	2.2	9.4	.....	11.6	4.7	10.9	3.0	1.0	1.1	4.5
31	.8	.....	.....	9.1	.....	10.2	.....	9.1	.....	1.0	1.1	.....

NOTE.—Observer made no notes concerning ice. Discharge relation probably not affected by ice during the year ending Sept. 30, 1913.

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NORTH FORK OF NEW RIVER NEAR CRUMPLER, N. C.

Location.—Half a mile above the confluence of North and South Forks of New River, and about 2½ miles north of Crumpler, N. C.

Records available.—August 13, 1908, to September 30, 1913.

Drainage area.—279 square miles.

Gage.—Staff gage attached to posts on right bank, read daily, morning and evening, to hundredths. Limits of use: Hundredths below 2.0, half-tenths from 2.0 to 3.0, and tenths above 3.0 feet. Chain gage in use from August 13, 1908, was replaced by the present staff gage July 23, 1911. The staff gage is at the same location and reads to same datum as former chain gage.

Control.—Practically permanent.

Discharge measurements.—Made from a boat at a section one-eighth mile below the gage, or by wading. The boat cable section was formerly at a ford one-fourth mile above gage, but was moved July 23, 1911, to a point one-eighth mile below gage.

Floods.—The flood of April 20, 1901, reached a height of about 16.4 feet referred to datum of the present gage.

Winter flow.—Little if at all affected by ice.

Accuracy.—Gage height record is considered very reliable. Data insufficient for estimates of discharge. Station not visited by Survey engineers during the year ending September 30, 1913, but on December 17, 1913, the station was visited and the elevations of bench marks and zero of gage were checked with a wye level and a discharge measurement was made.

Daily gage height, in feet, of North Fork of New River near Crumpler, N. C., for the year ending Sept. 30, 1913.

[J. J. Garvey, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.66	1.47	1.66	2.25	2.45	2.9	2.7	2.0	2.5	1.78	1.41	1.57
2	1.62	1.53	1.58	1.88	2.1	2.55	2.55	1.97	2.4	1.84	2.05	1.56
3	1.59	1.47	1.72	2.0	2.25	2.3	2.45	1.89	2.3	2.95	1.58	1.55
4	1.60	1.42	1.61	2.05	2.5	2.2	2.35	1.92	2.3	2.6	1.44	1.84
5	1.56	1.46	1.78	2.25	2.5	2.2	2.3	1.88	2.2	2.25	1.39	2.85
6	1.55	1.44	1.82	2.45	2.3	2.05	2.2	1.87	2.1	1.88	2.25	2.0
7	1.52	2.15	1.75	2.45	2.0	1.86	2.15	1.92	2.05	1.74	1.54	1.78
8	1.50	2.3	1.64	2.3	2.05	2.05	2.15	2.05	2.35	1.66	2.05	1.66
9	1.48	1.83	1.60	2.3	2.1	1.91	2.3	1.95	2.2	1.64	1.66	1.66
10	1.47	1.70	1.53	2.1	2.15	2.1	2.15	1.87	2.1	1.61	1.68	1.63
11	1.46	1.65	1.56	2.05	2.05	2.35	2.5	1.81	1.97	1.63	1.54	1.55
12	1.46	1.60	1.52	2.1	2.2	2.2	3.2	1.79	2.1	1.80	1.45	1.51
13	1.46	1.60	1.33	2.4	1.80	2.2	5.0	1.75	2.1	1.70	1.95	1.49
14	1.66	1.78	1.62	2.2	1.86	5.7	3.5	1.78	1.91	1.62	2.05	1.47
15	1.87	1.67	1.54	2.1	1.82	5.6	3.4	1.78	1.83	1.60	1.83	1.50
16	1.58	1.58	1.63	2.0	1.79	4.6	3.2	2.2	1.81	1.56	1.57	1.75
17	1.52	1.54	1.43	1.95	1.82	3.5	3.0	2.1	1.78	1.52	1.48	1.94
18	1.48	1.52	1.58	1.95	1.78	3.0	2.8	2.1	1.74	1.50	1.50	1.81
19	1.58	1.50	1.56	2.0	1.74	2.75	2.6	1.86	2.35	1.46	1.89	2.25
20	1.74	1.50	1.42	1.86	1.91	2.6	2.55	1.90	1.87	1.60	3.1	1.86
21	1.57	1.49	1.46	1.82	2.4	2.7	2.4	2.65	1.78	1.52	1.93	3.45
22	1.56	1.49	1.47	1.96	2.2	2.75	2.3	2.5	1.72	1.46	1.78	2.65
23	1.61	1.49	1.50	1.86	2.1	2.4	2.25	4.0	1.84	1.42	2.5	2.2
24	1.65	1.48	1.50	1.92	1.99	2.35	2.2	4.9	1.92	1.40	2.05	1.97
25	1.54	1.48	1.64	2.35	1.94	2.6	2.15	3.4	1.72	1.40	1.80	1.86
26	1.51	1.46	1.78	2.35	1.90	2.55	2.1	2.85	2.7	1.48	1.66	1.78
27	1.48	1.48	1.98	2.9	2.5	8.2	2.3	4.0	1.84	1.48	1.58	1.72
28	1.48	1.62	2.0	3.5	3.4	5.5	2.1	4.2	1.76	1.75	1.55	1.68
29	1.48	1.96	1.98	2.9	.....	3.75	2.1	3.45	1.68	1.97	1.47	1.69
30	1.46	1.70	2.15	2.55	.....	3.3	2.15	3.0	1.76	1.64	2.55	2.0
31	1.44	.....	2.85	2.4	.....	3.0	.....	2.7	.....	1.48	1.72	.....

NOTE.—Discharge relation probably affected by ice about Feb. 8–17. Observer reported mush ice Dec. 28, 1912 and Feb. 9, 1913.

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REED CREEK AT GRAHAMS FORGE, VA.

Location.—At highway bridge at Grahams Forge, Va.

Records available.—July 29, 1908, to September 30, 1913.

Drainage area.—247 square miles.

Gage.—Standard chain gage attached to bridge; read daily, morning and evening, to hundredths. Limits of use: Hundredths below 3.0, half-tenths from 3.0 to 4.5, and tenths above 4.5 feet.

Control.—Permanent; bottom solid rock.

Discharge measurements.—Made from downstream side of bridge.

Point of zero flow.—A determination by leveling, July 20, 1911, indicates that there would be no flow past the gage if the river stage were to fall to 0.6 foot, ±0.1 foot, by the gage datum.

Winter flow.—Discharge relation affected by ice for short periods.

Regulation.—Dam and gristmill just above the station. The storage is small, and the miller states that water flows over the dam at all times. The flow is therefore little, if at all, modified by the operation of the mill.

Accuracy.—Gage-height record considered accurate and reliable. Data insufficient for estimates of discharge.

No discharge measurements were made at this station during the year ending September 30, 1913.

Daily gage height, in feet, of Reed Creek at Grahams Forge, Va., for the year ending Sept. 30, 1913.

[J. T. Black, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.31	2.16	2.12	2.76	2.81	3.15	3.05	2.51	2.82	2.29	2.17	2.18
2	2.27	2.15	2.14	2.58	2.70	2.91	2.96	2.48	2.74	2.30	2.16	2.15
3	2.28	2.14	2.17	2.60	2.70	2.75	2.88	2.46	2.68	2.82	2.16	2.14
4	2.26	2.14	2.20	2.68	2.81	2.66	2.81	2.44	2.62	2.40	2.14	2.24
5	2.21	2.08	2.36	2.62	2.85	2.60	2.76	2.44	2.60	2.64	2.14	2.16
6	2.22	2.15	2.40	2.62	2.76	2.53	2.70	2.42	2.56	2.36	3.5	2.19
7	2.21	2.27	2.38	2.64	2.68	2.50	2.66	2.44	2.52	2.30	2.44	2.12
8	2.20	2.69	2.37	2.62	2.62	2.48	2.66	2.40	2.55	2.23	2.30	2.12
9	2.19	2.45	2.31	2.56	2.56	2.44	2.64	2.40	2.56	2.24	2.24	2.13
10	2.17	2.34	2.26	2.50	2.56	2.46	2.60	2.39	2.51	2.21	2.24	2.13
11	2.18	2.29	2.24	2.42	2.52	2.58	2.60	2.36	2.42	2.27	2.19	2.14
12	2.16	2.28	2.22	2.46	2.54	2.60	2.90	2.32	2.52	2.34	2.39	2.13
13	2.17	2.24	2.14	2.82	2.49	2.55	4.7	2.42	2.54	2.32	2.46	2.09
14	2.26	2.22	2.22	2.68	2.48	4.45	3.7	2.32	2.43	2.22	2.31	2.09
15	2.32	2.22	2.16	2.56	2.48	4.6	3.45	2.04	2.38	2.22	2.45	2.10
16	2.28	2.20	2.18	2.50	2.48	4.15	3.4	2.42	2.40	2.20	2.26	2.13
17	2.20	2.17	2.18	2.48	2.44	3.4	3.25	2.38	2.37	2.20	2.22	2.16
18	2.17	2.18	2.20	2.45	2.42	3.1	3.1	2.38	2.34	2.21	2.18	2.15
19	2.20	2.18	2.19	2.40	2.38	2.96	2.96	2.32	2.52	2.17	3.05	2.21
20	2.24	2.18	2.14	2.41	2.40	2.89	2.86	2.31	2.46	2.21	2.66	2.16
21	2.22	2.16	2.08	2.36	2.44	2.82	2.78	2.51	2.38	2.20	2.45	2.34
22	2.20	2.16	2.09	2.38	2.46	2.78	2.72	2.74	2.36	2.19	2.37	2.39
23	2.20	2.14	2.12	2.40	2.44	2.65	2.70	4.15	2.50	2.20	2.44	2.24
24	2.18	2.17	2.14	2.41	2.46	2.64	2.64	4.4	2.88	2.32	2.34	2.18
25	2.16	2.15	2.16	2.48	2.44	2.62	2.62	3.35	2.58	2.15	2.30	2.13
26	2.20	2.12	2.12	2.66	2.40	2.79	2.60	3.0	2.46	2.00	2.26	2.12
27	2.16	2.08	2.21	3.25	2.70	7.9	2.63	3.85	2.42	2.16	2.22	2.12
28	2.14	2.15	2.18	3.9	3.6	4.6	2.60	4.25	2.37	2.26	2.18	2.10
29	2.16	2.09	2.20	3.25	.....	3.7	2.59	3.45	2.34	2.56	2.18	2.12
30	2.15	2.14	2.36	2.97	.....	3.45	2.54	3.15	2.30	2.30	2.25	2.21
31	2.16	.....	3.25	2.84	.....	3.25	.....	2.98	.....	2.22	2.26	.....

NOTE.—Observer made no notes concerning ice. Discharge relation probably not materially affected by ice during the year ending Sept. 30, 1913.

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BIG REED ISLAND CREEK NEAR ALLISONIA, VA.

Location.—About 1,200 feet above a suspension footbridge at J. P. Thomas's farm, 1½ miles from Allisonia, Va., and half a mile above the mouth of Little Reed Island Creek.

Records available.—July 31, 1908, to September 30, 1913.

Drainage area.—291 square miles.

Gage.—Vertical staff fastened to a tree on right bank; read once daily to hundredths; after periods of precipitation it is read twice daily. Limits of use: Hundredths below 1.0, half-tenths from 1.0 to 2.0, and tenths above 2.0 feet.

Control.—Permanent. Channel at measuring section is liable to change caused by deposits of silt from ore washing.

Discharge measurements.—Made from downstream side of suspension footbridge 1,200 feet below gage, or by wading under bridge.

Point of zero flow.—A determination by leveling, July 19, 1911, indicates that there would be no flow past the gage if the river stage were to fall to −0.7 foot, ±0.2 foot.

Winter flow.—Discharge relation is sometimes affected by ice.

Accuracy.—Records of gage height considered reliable. Data insufficient for estimates of discharge.

No discharge measurements were made at this station during the year ending September 30, 1913.

Daily gage height, in feet, of Big Reed Island Creek near Allisonia, Va., for the year ending Sept. 30, 1913.

[K. M. Thomas, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	0.50	0.47	0.57	0.75	0.81	0.94	0.95	0.85	1.0	0.66	0.56	0.50
2	.47	.75	.58	.65	.70	.81	.93	.82	.96	.70	.49	.45
3	.48	.51	.60	.65	.81	.69	.90	.80	1.7	.71	.47	.45
4	.48	.46	.54	.87	.91	.65	.86	.78	.95	.81	.44	1.7
5	.47	.48	.89	.77	.74	.64	.87	.75	.89	.79	.43	1.15
6	.46	.46	.92	.68	.66	.60	.83	.72	.85	.64	.41	.70
7	.47	2.0	.88	.64	.59	.58	.80	.74	.83	.58	.43	.56
8	.45	1.55	.70	.66	.63	.57	.81	.78	.90	.57	.50	.54
9	.43	.85	.62	.63	.83	.56	.80	.72	.96	.55	.62	.64
10	.42	.70	.58	.58	.70	.66	.80	.73	.85	.53	.57	.52
11	.43	.64	.57	.57	.62	.87	.96	.75	.81	1.5	.58	.48
12	.43	.63	.55	.59	.64	.70	3.0	.70	.93	.88	.83	.48
13	.44	.66	.50	.69	.52	.63	2.0	.70	1.05	.80	.70	.47
14	.54	.76	.49	.60	.48	4.0	1.5	.70	.92	.61	.60	.45
15	.75	.67	.51	.53	.52	2.8	1.25	.69	.72	.60	.51	.44
16	.50	.58	.60	.55	.59	1.9	1.25	.87	.75	.60	.50	.49
17	.54	.44	.45	.54	.57	1.35	1.1	1.15	.75	.50	.47	.48
18	.47	.49	.50	.56	.55	1.1	1.0	1.0	.74	.55	.54	.84
19	.50	.57	.60	.60	.51	1.0	1.05	.81	.72	.53	.60	.80
20	.70	.55	.59	.57	.60	.98	.98	.74	.70	.61	.80	1.9
21	.50	.50	.54	.56	.80	1.0	.84	1.0	.67	.53	.55	4.0
22	.48	.51	.49	.54	.74	1.25	.82	1.0	.67	.51	.54	1.8
23	.45	.51	.50	.52	.68	.98	.80	3.2	.96	.48	.60	1.1
24	.50	.52	.58	.57	.61	.92	.88	3.0	.95	.47	.55	.76
25	.49	.50	.67	.56	.59	.89	.85	1.6	1.0	.50	.49	.75
26	.47	.49	.72	.66	.58	1.1	.82	1.25	1.05	.50	.46	.75
27	.45	.50	.80	1.0	.91	3.1	1.1	1.5	.81	.57	.48	.61
28	.45	.50	.90	1.55	1.35	1.75	.93	1.5	.73	.52	.82	.60
29	.45	.54	.89	.97	.....	1.3	.91	1.2	.67	.50	.48	.63
30	.46	.50	.72	.82	.....	1.1	.88	1.1	.66	.51	1.3	.60
31	.47	.....	1.1	.77	.....	1.05	.....	1.25	.....	.63	.82	.....

NOTE.—Concerning ice, observer reported as follows: Feb. 8, 1913, "mush ice"; Feb. 9, 1913, "backwater." Discharge relation probably affected by ice about Feb. 6–15.

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LITTLE RIVER NEAR COPPER VALLEY, VA.

Location.—At highway bridge, about 5 miles south of Childress and half a mile north of Copper Valley, Va., and 600 feet above the mouth of Indian Creek.

Records available.—July 25, 1908, to September 30, 1913.

Drainage area.—195 square miles.

Gage.—Standard chain gage attached to bridge; read daily, morning and evening, to hundredths. Limits of use: Hundredths below 4.0, half tenths from 4.0 to 5.0, and tenths above 5.0 feet.

Control.—Probably permanent.

Discharge measurements.—Made from downstream side of bridge.

Point of zero flow.—Determinations by leveling, July 18, 1911, and September 21, 1912, indicate that there would be no flow past the gage if the river stage were to fall to 1.8 feet, ±0.2 foot.

Winter flow.—Discharge relation affected by ice for short periods.

Accuracy.—Records of gage height are considered reliable. Sufficient data have not been obtained to permit estimates of discharge to be made.

No discharge measurements were made at this station during the year ending September 30, 1913.

Daily gage height in feet. of Little River near Copper Valley, Va., for the year ending Sept. 30, 1913.

[T. A. De Hart, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3.28	3.26	3.38	3.72	3.58	3.75	3.66	3.48	3.56	3.45	3.21	3.18
2	3.26	3.38	3.34	3.45	3.42	3.54	3.62	3.44	3.52	3.42	3.22	3.19
3	3.25	3.32	3.34	3.90	3.42	3.42	3.59	3.40	3.54	4.6	3.21	3.15
4	3.25	3.26	3.36	3.86	3.45	3.40	3.56	3.41	3.59	3.94	3.18	4.05
5	3.28	3.22	3.62	3.58	3.45	3.39	3.48	3.39	3.58	3.88	3.15	3.88
6	3.25	3.38	3.68	3.52	3.44	3.35	3.42	3.39	3.48	3.48	3.15	3.46
7	3.20	4.75	3.58	3.48	3.32	3.25	3.40	3.41	3.58	3.42	3.18	3.39
8	3.20	4.2	3.42	3.44	3.40	3.28	3.39	3.42	3.64	3.34	3.26	3.31
9	3.20	3.64	3.34	3.39	3.55	3.36	3.40	3.40	3.65	3.32	3.21	3.58
10	3.20	3.44	3.31	3.34	3.60	3.38	3.46	3.41	3.52	3.29	3.35	3.42
11	3.20	3.42	3.30	3.30	3.42	3.75	3.60	3.38	3.48	3.58	3.49	3.30
12	3.18	3.36	3.30	3.32	3.39	3.50	4.65	3.35	3.64	3.80	3.40	3.25
13	3.20	3.38	3.31	3.34	3.32	3.40	4.35	3.34	3.86	3.44	3.42	3.24
14	3.35	3.48	3.35	3.32	3.42	8.1	3.95	3.31	3.52	3.34	3.32	3.21
15	3.62	3.42	3.52	3.30	3.46	5.3	3.78	3.32	3.96	3.39	3.29	3.18
16	3.38	3.32	3.38	3.30	3.48	4.7	3.92	3.66	3.41	3.36	3.28	3.25
17	3.25	3.31	3.38	3.34	3.35	4.05	3.76	3.80	3.40	3.29	3.20	3.29
18	3.22	3.30	3.35	3.32	3.25	3.79	3.71	3.94	3.39	3.30	3.17	3.48
19	3.28	3.29	3.36	3.36	3.24	3.74	3.62	3.46	3.39	3.30	3.65	3.54
20	3.38	3.28	3.36	3.31	3.28	3.75	3.58	3.36	3.35	3.29	3.45	3.54
21	3.32	3.29	3.36	3.30	3.62	3.78	3.50	3.06	3.34	3.30	3.38	7.0
22	3.26	3.30	3.32	3.30	3.56	3.82	3.48	4.05	3.31	3.28	3.32	4.9
23	3.40	3.29	3.32	3.29	3.42	3 64	3.46	6.5	3.75	3.26	3.39	3.75
24	3.36	3.22	3.42	3.31	3.34	3.60	3.45	6.2	3.65	3.25	3.38	3.48
25	3.26	3.24	3.54	3.35	3.30	3.65	3.45	4.5	3.60	3.26	3.24	3.42
26	3.28	3.28	3.50	3.38	3.30	3.85	3.45	4.0	4.3	3.25	3.20	3.38
27	3.24	3.28	3.62	3.72	3.75	5.5	3.62	3.95	4.0	3.26	3.15	3.34
28	3.21	3.29	3.62	4.4	4.25	4.3	3.55	4.05	3.54	3.25	3.22	3.32
29	3.22	3.36	3.62	3.85	.....	3.92	3.51	3.88	4.05	3.25	3.28	3.31
30	3.22	3.40	3.65	3.65	.....	3.79	3.52	3.68	3.65	3.28	3.32	3.35
31	3.20	.....	4.02	3.62	.....	3.74	.....	3.60	.....	3.25	3.30	.....

NOTE.—Observer reported "ice" Feb. 7-9; "ice on pond," Feb. 13-15. Discharge relation probably affected by ice about Feb. 6-15.

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WALKER CREEK AT STAFFORDSVILLE, VA.

Location.—At highway bridge at Staffordsville, Va., 500 feet below the mouth of Whitley Creek.

Records available.—July 24, 1908, to September 30, 1913.

Drainage area.—277 square miles.

Gage.—Standard chain gage attached to bridge; read daily, morning and evening, to hundredths. Limits of use: Hundredths below 4.0, half-tenths from 4.0 to 5.0, and tenths above 5.0 feet.

Control.—Practically permanent.

Discharge measurements.—Made from downstream side of bridge.

Winter flow.—Discharge relation probably not affected by ice.

Regulation.—A dam and power plant 300 feet above the station may affect the flow at low water.

Accuracy.—Gage-height record considered reliable. Data insufficient for estimates of discharge.

No discharge measurements were made at this station during the year ending September 30, 1913.

Daily gage height, in feet, of Walker Creek at Staffordsville, Va., for the year ending Sept. 30, 1913.

[J. F. Durham, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3.49	3.04	3.14	4.5	4.45	5.0	4.8	3.62	4.85	3.38	3.01	3.03
2	3.42	3.04	3.16	4.1	4.3	4.7	4.55	3.58	4.4	3.42	3.28	2.95
3	3.34	2.99	3.16	4.15	4.3	4.25	4.35	3.55	4.2	3.41	3.02	2.92
4	3.32	3.05	3.22	4.3	4.4	4.1	4.25	3.50	4.25	4.05	2.95	2.94
5	3.26	3.02	3.35	4.15	4.3	4.0	4.1	3.50	4.1	5.4	2.91	2.94
6	3.23	3.04	3.50	4.05	4.25	3.94	3.99	3.44	3.90	4.2	2.90	2.95
7	3.20	3.82	3.66	4.05	4.0	3.75	3.83	3.50	3.80	3.75	2.96	2.92
8	3.16	4.9	3.61	4.05	3.80	3.74	3.84	3.48	4.25	3.52	3.01	2.92
9	3.14	4.25	3.54	4.0	3.78	3.70	3.79	3.44	4.25	3.42	3.02	2.89
10	3.14	3.93	3.46	3.95	4.8	3.76	3.76	3.40	4.05	3.34	3.03	2.86
11	3.10	3.72	3.42	3.90	3.80	3.86	3.85	3.34	3.85	3.32	2.96	2.87
12	3.08	3.58	3.36	3.94	3.81	3.88	4.7	3.30	3.89	3.65	3.05	2.82
13	3.11	3.50	3.08	4.6	3.65	3.89	7.8	3.32	3.90	3.64	3.30	2.85
14	3.12	3.50	3.20	4.35	3.56	6.6	6.2	3.32	3.74	3.36	3.32	2.80
15	3.22	3.44	3.20	4.1	3.61	7.6	5.5	3.32	3.61	3.40	3.16	2.78
16	3.24	3.32	3.27	3.98	3.68	6.8	5.2	3.38	3.50	3.32	3.04	2.82
17	3.14	3.30	3.24	3.88	3.66	5.5	5.0	3.46	3.46	3.28	2.97	2.86
18	3.10	3.26	3.24	3.82	3.58	4.95	4.75	3.47	3.57	3.22	2.98	2.90
19	3.18	3.22	3.22	3.74	3.50	4.65	4.55	3.39	3.54	3.20	3.02	2.98
20	3.20	3.21	3.20	3.68	3.52	4.5	4.35	3.32	3.44	3.14	4.0	3.02
21	3.22	3.19	3.14	3.60	3.59	4.35	4.2	3.99	3.38	3.18	3.32	3.14
22	3.21	3.20	3.14	3.62	3.59	4.3	4.05	3.84	3.32	3.11	3.20	3.50
23	3.16	3.18	3.04	3.60	3.50	4.05	4.0	5.6	3.64	3.08	3.16	3.33
24	3.15	3.16	3.11	3.65	3.56	4.0	3.90	7.2	3.98	3.09	3.17	3.15
25	3.13	3.15	3.02	3.76	3.58	3.99	3.83	5.5	3.93	3.12	3.06	3.04
26	3.08	3.11	3.00	3.83	3.53	4.3	3.80	4.8	3.70	3.02	3.00	2.99
27	3.05	3.12	3.29	4.6	4.35	13.4	3.85	5.6	3.72	3.01	2.94	2.94
28	3.06	3.14	3.08	5.9	5.6	7.8	3.81	6.1	3.82	3.02	2.92	2.88
29	3.02	3.08	3.20	5.1	.....	6.1	3.80	5.2	3.58	3.08	2.92	2.90
30	3.06	3.08	3.66	4.7	.....	5.5	3.74	4.8	3.46	3.02	2.98	2.95
31	3.05	.....	5.20	4.5	.....	5.2	.....	5.6	.....	3.04	3.15	.....

NOTE.—Observer made no notes concerning ice. Discharge relation probably not materially affected by ice during the year ending Sept. 30, 1913.

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WOLF CREEK NEAR NARROWS, VA.

Location.—At highway bridge 3 miles above Narrows, Va., 1,500 feet below the New River, Holston & Western Railroad bridge, and 2½ miles above mouth of Mill Creek.

Records available.—July 22, 1908, to September 30, 1913.

Drainage area.—223 square miles.

Gage.—Standard chain gage attached to bridge; read daily, morning and evening, to hundredths. Limits of use: Hundredths below 3.5, half tenths from 3.5 to 4.5, and tenths above 4.5 feet.

Control.—Practically permanent.

Discharge measurements.—Made from downstream side of bridge.

Floods.—A stage of approximately 15.5 feet, referred to the gage datum, has been reached at this station; date unknown.

Point of zero flow.—A determination by leveling July 15, 1911, indicates that there would be no flow past the gage if the river stage were to fall to 1.1 feet ±0.2 foot.

Winter flow.—Discharge relation not affected by ice except for short periods during extremely cold weather.

Accuracy.—Records of gage height considered reliable. Data insufficient for estimates of discharge.

No discharge measurements were made at this station during the year ending September 30, 1913.

Daily gage height, in feet, of Wolf Creek near Narrows, Va., for the year ending Sept. 30, 1913.

[J. A. Hale, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.82	2.68	2.75	3.95	4.1	4.4	4.1	3.19	3.9	2.90	2.55	2.61
2	2.73	2.68	2.70	3.6	3.95	4.1	3.9	3.14	3.65	2.88	2.54	2.52
3	2.69	2.68	2.69	3.6	3.9	3.9	3.75	3.10	3.45	2.86	2.51	2.50
4	2.68	2.66	2.80	3.65	4.05	3.7	3.6	3.09	3.48	2.89	2.49	2.48
5	2.66	2.61	3.02	3.55	4.0	3.6	3.5	3.01	3.35	3.44	2.48	2.46
6	2.64	2.62	3.25	3.14	3.9	3.49	3.42	3.00	3.22	3.08	2.54	2.45
7	2.64	2.98	3.36	3.85	3.7	3.39	3.34	3.00	3.19	2.92	2.66	2.44
8	2.61	3.75	3.31	3.85	3.6	3.28	3.30	3.02	3.7	2.80	2.58	2.46
9	2.60	3.45	3.20	4.35	3.48	3.25	3.26	3.00	3.7	2.74	2.58	2.46
10	2.60	3.24	3.11	4.05	3.40	3.25	3.20	2.98	3.48	2.71	2.54	2.46
11	2.74	3.12	3.06	3.9	3.42	3.38	3.27	2.94	3.36	2.72	2.58	2.42
12	2.58	3.01	3.01	4.15	3.6	3.44	4.2	2.90	3.45	3.29	2.70	2.40
13	2.58	3.00	2.90	4.8	3.45	3.42	5.2	2.88	3.38	2.95	2.67	2.43
14	2.67	3.00	2.84	4.3	3.35	4.6	4.7	2.88	3.29	2.85	2.66	2.38
15	2.84	2.96	2.83	4.0	3.28	5.8	4.35	3.02	3.14	2.79	2.66	2.34
16	2.76	2.89	2.88	3.8	3.28	5.8	4.3	2.90	3.04	2.80	2.63	2.40
17	2.70	2.86	2.83	3.65	3.32	4.8	3.7	2.94	3.11	2.72	2.56	2.46
18	2.66	2.82	2.84	3.6	3.27	4.3	4.0	2.99	3.08	2.74	2.51	2.54
19	2.69	2.78	2.84	3.48	3.19	4.1	3.9	2.90	3.25	2.82	2.48	2.62
20	2.79	2.76	2.79	3.38	3.20	3.9	3.75	2.84	3.15	2.78	2.64	2.52
21	2.86	2.72	2.78	3.39	3.25	3.8	3.55	2.93	3.00	2.70	2.64	2.76
22	2.72	2.72	2.76	3.7	3.24	3.75	3.46	3.00	2.91	2.65	2.60	3.07
23	2.76	2.70	2.72	3.6	3.20	3.55	3.40	3.32	3.15	2.59	2.62	2.86
24	2.79	2.74	2.74	3.75	3.22	3.48	3.36	5.2	3.35	2.62	2.72	2.74
25	2.80	2.70	2.66	4.05	3.22	3.46	3.29	4.3	3.30	2.70	2.63	2.62
26	2.78	2.69	2.78	4.15	3.18	3.5	3.25	3.9	3.12	2.66	2.56	2.57
27	2.74	2.69	2.90	4.35	3.85	10.2	3.35	4.6	3.04	2.64	2.50	2.52
28	2.70	2.72	2.86	4.8	4.8	7.0	3.29	5.4	3.28	2.61	2.46	2.48
29	2.69	2.70	2.90	4.35	.....	5.4	3.30	4.6	3.04	2.66	2.44	2.48
30	2.68	2.68	3.08	4.1	.....	4.8	3.27	4.15	2.94	2.62	2.74	2.49
31	2.67	.....	4.62	4.0	.....	4.4	.....	4.45	.....	2.58	2.76	.....

NOTE.—Observer made no notes concerning ice. Discharge relation probably not materially affected by ice during the year ending Sept. 30, 1913.

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BLUESTONE RIVER AT LILLY, W. VA.

Location.—At Lilly, W. Va., 2,000 feet below the mouth of Little Bluestone River.

Records available.—August 22, 1908, to January 13, 1912; July 21 to November 7, 1912; January 15 to September 30, 1913.

Drainage area.—454 square miles.

Gage.—Vertical staff gage in two sections; read daily, morning and evening, to hundredths. Limits of use: Hundredths below 2.0, half-tenths from 2.0 to 3.5, and tenths above 3.5 feet.

Control.—Practically permanent.

Discharge measurements.—Made from a boat 150 feet above gage, or by wading.

Point of zero flow.—Levels taken August 24, 1910, indicate that there would be no flow past the gage if the river stage were to fall to 0.0 foot ±0.2 foot.

Winter flow.—During portions of December, January, and February the discharge relation may be affected by ice.

Accuracy.—Data insufficient for estimates of discharge.

No discharge measurements were made at this station during the year ending September 30, 1913.

Daily gage height, in feet, of Bluestone River at Lilly, W. Va., for the year ending Sept. 30, 1913.

[W. H. Lilly, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.41	1.23	.....	.....	3.2	4.2	2.75	1.86	2.7	1.33	1.30	1.42
2	1.34	1.19	.....	.....	3.0	3.1	2.55	1.80	2.4	1.39	1.25	1.36
3	1.27	1.18	.....	.....	2.9	2.75	2.4	1.72	2.35	1.96	1.25	1.31
4	1.23	1.17	.....	.....	3.3	2.5	2.3	1.72	3.5	2.2	1.21	1.31
5	1.21	1.23	.....	.....	3.3	2.3	2.15	1.71	4.2	2.3	1.19	1.30
6	1.15	1.30	.....	.....	2.95	2.3	2.05	1.71	3.2	2.15	1.21	1.27
7	1.13	1.35	.....	.....	2.6	2.1	2.0	1.64	2.65	2.15	1.17	1.23
8	1.11	.....	.....	.....	2.4	2.05	1.95	1.62	4.3	2.1	1.22	1.21
9	1.05	.....	.....	.....	2.6	1.92	1.98	1.65	4.5	1.99	1.20	1.27
10	1.03	.....	.....	.....	2.25	2.05	1.94	1.61	3.4	1.90	1.21	1.21
11	1.02	.....	.....	.....	2.3	3.35	1.88	1.64	2.65	1.87	1.19	1.20
12	0.99	.....	.....	.....	2.85	3.45	1.87	1.57	2.45	1.76	1.21	1.20
13	1.04	.....	.....	.....	2.75	3.0	2.45	1.42	2.3	1.59	1.25	1.24
14	1.09	.....	.....	.....	2.6	4.6	3.25	1.44	2.1	1.51	1.20	1.22
15	1.17	.....	.....	2.85	2.7	4.7	3.3	1.42	2.0	1.23	1.23	1.15
16	1.23	.....	.....	2.55	2.35	4.6	3.2	1.48	1.64	1.32	1.21	1.07
17	1.25	.....	.....	2.4	2.2	3.6	2.9	1.52	1.52	1.37	1.13	1.01
18	1.32	.....	.....	2.35	2.1	3.0	2.85	1.62	1.54	1.41	1.11	.99
19	1.38	.....	.....	2.35	1.99	2.65	2.55	1.67	1.77	1.43	1.13	.93
20	1.42	.....	.....	2.3	1.92	2.75	2.35	1.54	1.71	1.61	1.15	.85
21	1.43	.....	.....	2.35	2.05	2.65	2.1	1.44	1.59	1.63	1.23	1.35
22	1.48	.....	.....	2.8	2.3	2.35	1.94	1.62	1.53	1.59	1.33	1.63
23	1.52	.....	.....	2.95	2.1	2.2	1.92	1.90	1.56	1.51	1.41	1.53
24	1.52	.....	.....	4.6	2.0	2.1	1.90	3.6	1.49	1.47	1.41	1.47
25	1.49	.....	.....	4.4	2.0	2.05	1.88	3.1	1.53	1.43	1.45	1.36
26	1.45	.....	.....	4.0	1.92	2.2	1.84	2.45	1.60	1.40	1.41	1.31
27	1.38	.....	.....	3.9	3.9	8.2	1.88	3.05	1.69	1.35	1.33	1.27
28	1.33	.....	.....	4.0	4.9	6.6	1.91	4.1	1.56	1.31	1.29	1.20
29	1.38	.....	.....	3.5	.....	4.2	2.0	3.8	1.49	1.30	1.13	1.09
30	1.32	.....	.....	3.2	.....	3.5	1.92	3.35	1.35	1.26	1.31	.99
31	1.25	.....	.....	3.1	.....	3.05	.....	2.85	.....	1.30	1.43	.....

NOTE.—Observer made no notes concerning ice. Discharge relation probably not materially affected by ice during the year ending Sept. 30, 1913.

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GREENBRIER RIVER NEAR MARLINTON, W. VA.

Location.—At Chesapeake & Ohio Railway bridge on the switch that runs to Campbell's lumber mill, 1½ miles above Marlinton, W. Va., and immediately below the mouth of Stoney Creek.

Records available.—July 9, 1908, to September 30, 1913.

Drainage area.—408 square miles.

Gage.—Standard chain gage attached to bridge; read daily, morning and evening, to hundredths. Limits of use: Hundredths below 4.5, half-tenths from 4.5 to 5.5, and tenths above 5.5 feet.

Control.—Probably not permanent. Bed at measuring section composed of coarse gravel.

Discharge measurements.—Made from downstream side of bridge.

Point of zero flow.—A determination by leveling, September 6, 1912, indicates that there would be no flow past the gage if the river were to fall to 2.7 feet, ±0.1 foot.

Winter flow.—Discharge relation may be affected by ice for short periods during December, January, and February.

Accuracy.—Data insufficient for estimates of discharge.

No discharge measurements were made at this station during the year ending September 30, 1913.

Daily gage height, in feet, of Greenbrier River near Marlinton, W. Va., for the year ending Sept. 30, 1913.

[A. N. Rudd, U. G. Simpson, and C. H. McCoy, observers.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3.78	3.48	3.62	5.4	5.0	4.95	4.95	4.32	5.2	3.68	3.76	3.22
2	3.62	3.45	3.56	4.7	.....	4.8	4.75	4.27	4.95	3.60	3.88	3.33
3	3.64	3.45	3.64	5.3	.....	4.45	4.6	4.25	4.9	3.50	3.70	3.28
4	3.50	3.42	3.88	5.6	5.8	4.5	4.5	4.22	4.9	3.66	3.60	3.40
5	3.49	3.40	4.02	5.2	5.5	4.35	4.42	4.00	4.9	3.83	3.53	3.40
6	3.45	3.40	4.7	5.1	5.1	4.28	4.35	3.92	4.6	3.89	3.42	3.36
7	3.40	5.45	4.8	7.6	4.65	4.12	4.28	3.98	4.36	3.80	3.37	3.26
8	3.44	5.9	4.5	7.9	4.42	3.95	4.20	4.05	4.45	3.74	3.32	3.36
9	3.42	5.1	4.25	7.2	4.38	4.08	4.20	3.96	4.40	3.68	3.28	3.33
10	3.40	4.6	4.18	5.9	4.28	4.12	4.15	3.84	4.37	8.9	3.28	3.36
11	3.40	4.36	4.15	5.35	4.28	5.3	4.15	3.78	4.15	8.1	3.36	3.33
12	3.40	4.15	4.08	5.15	4.32	5.3	5.9	3.73	4.04	6.5	3.63	3.27
13	3.40	4.00	4.03	5.5	4.25	5.1	7.7	3.64	3.98	4.8	5.0	3.23
14	3.40	3.95	4.00	5.2	4.35	7.5	6.3	3.68	3.87	4.44	5.4	3.18
15	3.38	3.90	4.10	4.9	4.25	7.0	7.9	3.68	3.82	4.32	4.23	3.17
16	3.38	3.82	4.10	4.65	4.15	6.3	7.3	3.78	3.76	4.27	3.78	3.13
17	3.36	3.70	3.92	4.55	4.00	5.5	6.2	3.82	3.70	4.23	3.62	3.18
18	3.38	3.70	3.92	4.45	3.90	5.0	5.6	4.31	3.68	4.14	3.78	3.30
19	3.38	3.63	3.85	4.35	3.90	4.8	5.15	4.8	3.64	4.18	4.15	3.58
20	3.45	.....	3.85	4.30	3.90	4.65	5.0	4.7	3.63	4.26	3.93	3.86
21	3.48	3.62	3.85	4.22	3.98	4.5	4.85	4.8	3.62	4.03	3.80	4.03
22	3.48	3.61	3.80	4.20	4.22	4.40	4.6	4.7	3.62	3.86	3.80	4.09
23	3.50	3.60	3.65	4.20	4.48	4.22	4.5	5.05	3.68	3.80	4.40	3.96
24	3.60	3.56	.....	4.48	4.32	4.20	4.5	7.1	3.72	3.84	4.46	3.87
25	3.70	3.53	[a]3.8	5.0	4.22	4.18	4.42	6.6	3.76	3.82	4.33	3.80
26	3.68	3.50	.....	4.9	4.15	4.30	4.32	6.4	3.92	3.74	4.18	3.66
27	3.62	3.50	.....	4.9	4.30	11.8	4.35	7.4	4.10	3.72	3.98	3.50
28	3.60	3.58	.....	4.9	5.0	8.1	4.40	7.6	4.00	3.66	3.78	3.42
29	3.55	3.50	.....	4.75	.....	6.2	4.5	7.1	3.90	3.55	3.62	3.37
30	3.52	3.50	3.80	4.5	.....	5.5	4.38	6.2	3.86	3.48	3.46	3.34
31	3.50	.....	6.3	.....	.....	5.2	.....	5.4	.....	3.53	3.26	.....

[a] Gage height to top of ice.

NOTE.—Discharge relation probably affected by ice during most of December, 1912, and from Feb. 6–16, 1913. On Dec. 1 and 2 observer reported river frozen over; Dec. 4–6, general rain; Dec. 12, ice running; Dec. 13, river frozen over; Dec. 14, "ice gorges up sometimes"; Dec. 25, ice heavy, with snow on top of it; Dec. 30–31, cause of rise, general rain on heavy snow; Feb. 4–9, freezing weather; Feb. 13, ice flowing.

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GREENBRIER RIVER AT ALDERSON, W. VA.

Location.—At highway bridge at Alderson, W. Va., half a mile above the mouth of Muddy Creek.

Records available.—August 1, 1895, to July 15, 1906; May 10, 1907, to September 30, 1913.

Drainage area.—1,340 square miles.

Gage.—Standard chain gage attached to bridge; read daily, morning and evening, to hundredths. Limits of use: Hundredths below 3.0, half-tenths from 3.0 to 4.0, and tenths above 4.0 feet.

Control.—Permanent, or nearly so; channel wide and shallow.

Discharge measurements.—Made from downstream side of bridge.

Floods.—No record of floods previous to installation of the gage. Maximum gage height since establishment of gage, 18.2 feet, November 26, 1900.

Winter flow.—Little, if any, affected by ice.

The following discharge measurement was made by H. J. Jackson:
June 20, 1913: Gage height, 2.17 feet; discharge, 459 second-feet.

Daily gage height, in feet, of Greenbrier River at Alderson, W. Va., for the year ending Sept. 30, 1913.

[W. J. Hancock, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.04	1.86	1.79	6.0	3.7	4.3	3.7	2.72	4.4	2.24	2.12	1.90
2	1.98	1.85	1.85	4.2	3.75	3.9	3.4	2.65	3.75	2.32	2.05	1.90
3	1.90	1.82	1.90	3.45	3.65	3.5	3.2	2.58	3.4	2.14	2.22	1.78
4	1.89	1.81	2.05	4.2	5.2	3.2	3.05	2.54	4.6	2.60	2.06	1.79
5	1.83	1.80	2.20	4.0	5.1	3.1	2.95	2.50	4.4	2.85	1.98	1.74
6	1.79	1.80	2.70	3.75	4.2	3.0	2.84	2.46	3.6	2.74	1.91	1.78
7	1.80	2.00	3.4	5.2	3.65	2.84	2.72	2.66	3.2	2.80	1.86	1.70
8	1.78	4.6	3.2	7.4	3.2	2.68	2.64	2.71	3.6	2.59	1.80	1.72
9	1.76	3.95	2.90	7.2	2.98	2.51	2.59	2.61	3.55	2.38	1.78	1.70
10	1.75	3.2	2.68	6.2	2.91	2.62	2.54	2.52	3.25	2.30	1.75	1.70
11	1.74	2.86	2.52	4.2	2.91	3.6	2.54	2.44	2.99	5.5	1.85	1.66
12	1.72	2.64	2.42	3.8	3.05	4.6	3.35	2.36	2.78	3.7	1.92	1.66
13	1.71	2.48	2.31	3.9	2.87	4.0	8.8	2.31	2.69	3.2	1.99	1.70
14	1.73	2.38	2.12	3.9	2.70	6.1	6.7	2.30	2.58	2.85	3.5	1.63
15	1.82	2.30	2.02	3.55	2.62	8.2	8.2	2.28	2.48	2.65	3.45	1.64
16	1.80	2.24	2.16	3.3	2.60	6.8	7.0	2.25	2.38	2.55	2.76	1.69
17	1.78	2.19	2.26	3.1	2.68	5.1	5.4	2.32	2.32	2.52	2.45	1.65
18	1.74	2.12	2.21	3.05	2.58	4.1	4.4	2.42	2.26	2.41	2.26	1.69
19	1.79	2.09	2.18	2.94	2.49	3.65	3.9	2.76	2.20	2.31	2.28	1.71
20	1.88	2.05	2.16	2.88	2.44	3.4	3.6	2.82	2.15	2.50	2.20	1.68
21	2.14	2.02	2.00	2.81	2.46	3.2	3.35	3.7	2.10	2.68	2.19	1.79
22	2.02	1.99	1.88	2.76	2.52	3.1	3.1	3.25	2.08	2.45	2.18	1.97
23	2.02	1.95	1.78	2.75	2.65	2.95	2.99	3.25	2.05	2.32	2.28	2.02
24	2.09	1.94	1.85	2.82	2.84	2.80	2.89	5.0	2.06	2.29	2.84	2.15
25	2.20	1.92	1.95	3.5	2.79	2.74	2.80	5.2	2.06	2.22	2.75	2.04
26	2.15	1.93	1.91	3.8	2.69	2.89	2.70	4.1	2.35	2.42	2.45	1.92
27	2.11	1.90	1.95	3.8	2.82	14.7	2.74	4.3	2.54	2.32	2.28	1.85
28	2.02	1.90	2.16	4.2	3.95	12.8	2.80	7.8	2.48	2.20	2.16	1.80
29	1.98	1.88	2.04	3.9	.....	6.2	2.82	5.9	2.32	2.14	2.09	1.79
30	1.96	1.81	2.88	3.6	.....	4.8	2.79	4.5	2.22	2.08	2.01	1.75
31	1.90	.....	7.0	3.45	.....	4.1	.....	4.8	.....	2.10	1.95	.....

NOTE.—Discharge relation probably not affected by ice during the year ending Sept. 30, 1913.

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Daily discharge, in second-feet, of Greenbrier River at Alderson, W. Va., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	347	223	183	9,700	3,350	4,880	3,350	1,190	5,150	533	415	246
2	301	217	217	4,620	3,480	3,850	2,620	1,080	3,480	622	356	246
3	246	200	246	2,740	3,220	2,860	2,140	971	2,620	434	512	178
4	240	194	356	4,620	7,360	2,140	1,820	913	5,690	1,000	364	183
5	205	188	490	4,100	7,080	1,920	1,620	855	5,150	1,420	301	159
6	183	188	1,160	3,480	4,620	1,720	1,400	801	3,100	1,230	253	178
7	188	315	2,620	7,360	3,220	1,400	1,190	1,100	2,140	1,330	223	140
8	178	5,690	2,140	14,300	2,140	1,130	1,060	1,180	3,100	986	188	150
9	169	3,980	1,520	13,600	1,680	870	986	1,020	2,980	696	178	140
10	164	2,140	1,130	10,300	1,540	1,030	913	884	2,260	598	164	140
11	159	1,440	884	4,620	1,540	3,100	913	774	1,700	8,230	217	124
12	150	1,060	747	3,600	1,820	5,690	2,500	671	1,300	3,350	260	124
13	145	828	610	3,850	1,460	4,100	19,300	610	1,140	2,140	308	140
14	154	696	415	3,850	1,160	10,000	11,900	598	971	1,420	2,860	113
15	200	598	331	2,980	1,030	17,100	17,100	576	828	1,080	2,740	117
16	188	533	452	2,380	1,000	12,300	12,900	544	696	928	1,260	136
17	178	481	555	1,920	1,130	7,080	7,940	622	622	884	788	120
18	159	415	501	1,820	971	4,360	5,150	747	555	734	555	136
19	183	388	471	1,600	842	3,220	3,850	1,260	490	610	576	145
20	234	356	452	1,480	774	2,620	3,100	1,370	443	855	490	132
21	434	331	315	1,350	801	2,140	2,500	3,350	396	1,130	481	183
22	331	308	234	1,260	884	1,920	1,920	2,260	380	788	471	294
23	331	280	178	1,240	1,080	1,620	1,700	2,260	356	622	576	331
24	388	274	217	1,370	1,400	1,330	1,500	6,800	364	587	1,400	443
25	490	260	280	2,860	1,310	1,230	1,330	7,360	364	512	1,240	347
26	443	267	253	3,600	1,140	1,500	1,160	4,360	659	747	788	260
27	406	246	280	3,600	1,370	42,500	1,230	4,880	913	622	576	217
28	331	246	452	4,620	3,980	34,700	1,330	15,700	828	490	452	188
29	301	234	347	3,850	.....	10,300	1,370	9,400	622	434	388	183
30	287	194	1,480	3,100	.....	6,240	1,310	5,420	512	380	323	164
31	246	.....	12,900	2,740	.....	4,360	.....	6,240	.....	396	280	.....

NOTE.—Daily discharge computed from a rating curve well defined between 46 and 8,230 second-feet (gage heights 1.4 and 5.5 feet).

Monthly discharge of Greenbrier River at Alderson, W. Va., for the year ending Sept. 30, 1913.

[Drainage area, 1,340 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	490	145	257	0.192	0.22	A.
November	5,690	188	759	.566	.63	B.
December	12,900	178	1,050	.784	.90	B.
January	14,300	1,240	4,270	3.19	3.68	A.
February	7,360	774	2,190	1.63	1.70	A.
March	42,500	870	6,430	4.80	5.53	B.
April	19,300	913	3,900	2.91	3.25	B.
May	15,700	544	2,770	2.07	2.39	B.
June	5,690	356	1,660	1.24	1.38	A.
July	8,230	380	1,150	.858	.99	B.
August	2,860	164	645	.481	.55	A.
September	443	113	189	.141	.16	A.
The year	42,500	113	2,110	1.57	21.38	

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GAULEY RIVER AT ALLINGDALE, W. VA.

Location.—At Baltimore & Ohio Railroad bridge, one-fourth mile south of depot at Allingdale, W. Va., and immediately below mouth of Rock Creek.

Records available.—July 3, 1908, to September 30, 1913.

Drainage area.—248 square miles.

Gage.—Standard chain gage attached to bridge; read once daily to hundredths. Limits of use: Hundredths below 5.0, half-tenths from 5.0 to 7.0, and tenths above 7.0 feet.

Control.—Probably permanent.

Discharge measurements.—Made from upstream side of bridge or from wooden bridge near depot. The bottom of the stream is rough and irregular, but with extreme care accurate measurements can be made. The measuring section at the railroad bridge is a poor one, and measurements are made at the wooden bridge near the railroad depot whenever possible.

Point of zero flow.—Levels taken August 15, 1910, indicate that there would be no flow past the gage if the river were to fall to 3.33 feet, ±0.2 foot.

Winter flow.—Ice may affect the discharge relation for short periods during December, January, and February.

Accuracy.—Data insufficient for estimates of discharge.

No discharge measurements were made at this station during the year ending September 30, 1913.

Daily gage height, in feet, of Gauley River at Allingdale, W. Va., for the year ending Sept. 30, 1913.

[Harry Jones, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	5.15	5.0	4.80	6.2	6.6	6.4	6.1	6.25	7.6	5.05	4.61	4.44
2	5.05	5.15	4.89	6.3	6.15	6.2	5.9	5.95	6.65	4.95	4.62	4.35
3	5.0	5.15	5.2	6.7	6.3	5.8	5.7	5.75	5.95	4.77	4.47	4.30
4	4.90	5.05	5.5	6.6	8.5	5.85	5.6	5.55	5.8	6.25	4.37	4.26
5	4.84	5.0	5.9	6.2	7.2	5.7	5.55	5.4	5.65	5.4	4.35	4.24
6	4.78	4.98	6.4	7.2	6.2	5.6	5.5	5.35	5.4	6.0	4.31	4.14
7	4.75	5.05	6.5	9.1	6.05	5.35	5.35	5.3	5.35	5.95	4.28	4.22
8	4.70	9.0	6.25	10.1	6.0	5.2	5.3	5.2	6.6	5.5	4.26	4.79
9	4.68	7.0	5.9	9.1	5.9	5.4	5.25	5.15	6.55	5.25	4.26	4.76
10	4.64	6.2	5.65	7.4	6.0	5.45	5.2	5.05	6.0	5.35	4.27	4.56
11	4.60	5.9	5.6	6.7	5.85	6.0	5.2	4.95	5.6	6.15	4.26	4.43
12	4.60	5.65	5.6	6.5	7.3	7.0	6.0	4.92	5.45	5.3	4.86	4.36
13	4.60	5.5	5.4	7.4	6.4	6.55	6.0	4.87	5.25	5.45	5.35	4.34
14	4.60	5.5	5.05	6.7	6.25	7.2	6.3	4.85	5.1	5.3	5.1	4.27
15	4.60	5.4	5.15	6.2	6.0	7.7	8.1	4.85	5.0	5.2	4.76	4.14
16	4.62	5.3	5.4	6.0	5.9	7.3	8.1	4.89	4.87	5.5	4.56	4.15
17	4.62	5.25	5.4	5.8	5.6	6.6	7.1	5.25	4.87	5.35	4.59	4.25
18	4.62	5.2	5.1	5.7	5.85	6.2	6.4	6.0	4.75	5.15	4.61	4.99
19	4.74	5.15	5.1	5.7	5.7	5.95	6.1	5.6	4.62	5.15	4.71	4.74
20	5.35	5.15	5.15	5.65	5.3	5.8	6.0	5.45	4.59	5.95	5.1	4.71
21	5.15	5.15	5.1	5.5	5.45	5.65	5.7	5.3	4.59	5.35	4.76	5.45
22	4.95	5.15	5.9	6.0	5.8	5.65	5.55	5.55	4.54	5.15	4.83	5.4
23	5.05	5.15	4.7	6.75	6.15	5.3	5.55	5.65	4.69	5.05	6.5	5.25
24	6.1	4.98	5.0	6.1	5.8	5.35	5.4	8.9	4.85	5.45	5.8	5.2
25	5.7	4.98	4.85	7.1	5.65	5.35	5.5	7.1	4.72	5.35	5.15	4.96
26	5.45	4.90	4.86	6.85	5.5	5.65	5.25	6.4	7.4	5.25	4.96	4.16
27	5.45	4.85	5.0	6.45	5.6	11.0	5.5	9.4	5.5	5.15	4.85	4.56
28	5.3	4.75	5.2	6.15	6.25	8.7	6.3	10.3	5.4	5.0	4.70	4.57
29	5.2	5.0	[a]5.3	5.9	.....	7.2	6.2	8.1	5.05	4.86	4.75	4.65
30	5.1	4.68	5.4	5.75	.....	6.7	6.7	6.95	4.97	4.76	4.56	4.68
31	5.1	.....	8.5	5.8	.....	6.3	.....	11.2	.....	4.68	4.50	.....

[a] Gage height to top of ice.

NOTE.—Observer made no notes relative to ice during 1913. Discharge relation probably not materially affected by ice during the year ending Sept. 30, 1913.

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GAULEY RIVER NEAR SUMMERSVILLE, W. VA.

Location.—At highway bridge known as Brock's Bridge, 2½ miles southeast of Summersville, W. Va., and one-eighth mile below mouth of Muddlety Creek.

Records available.—July 6, 1908, to September 30, 1913.

Drainage area.—686 square miles.

Gage.—Standard chain gage attached to bridge; read daily, morning and evening, to hundredths. Limits of use: Hundredths below 4.5, half-tenths from 4.5 to 6.0, and tenths above 6.0 feet.

Control.—Practically permanent.

Discharge measurements.—Made from downstream side of bridge.

Winter flow.—Discharge relation possibly affected by ice for short periods.

Accuracy.—Gage-height record considered reliable; data insufficient for estimates of discharge.

No discharge measurements were made at this station during the year ending September 30, 1913.

Daily gage height, in feet, of Gauley River near Summersville, W. Va., for the year ending Sept. 30, 1913.

[J. W. Dermody, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	5.4	4.95	4.6	9.0	7.5	7.9	7.3	7.7	9.2	5.55	4.11	4.35
2	5.7	4.42	4.65	7.7	7.3	7.2	6.9	7.1	8.1	5.35	4.65	4.15
3	5.7	5.05	5.9	7.4	7.7	6.8	6.6	6.8	7.2	4.9	4.85	3.95
4	5.6	5.2	6.2	8.2	10.5	6.3	6.4	6.5	6.3	6.7	4.6	4.08
5	4.46	4.55	7.2	7.4	9.4	6.4	5.85	5.9	6.4	6.0	3.55	3.83
6	4.36	3.87	7.8	9.3	7.8	6.2	5.65	5.8	5.95	9.3	4.08	3.53
7	4.33	7.3	8.5	12.4	7.0	6.1	5.55	5.7	5.9	7.8	3.91	3.88
8	4.5	11.4	7.4	13.9	6.0	6.2	6.1	5.5	8.2	6.2	3.93	5.5
9	4.08	9.2	6.8	13.3	6.1	5.8	5.75	5.35	8.4	5.8	3.83	5.2
10	3.83	7.8	6.4	9.7	5.7	5.75	5.55	5.25	7.5	7.0	3.58	4.9
11	4.40	7.3	6.2	8.7	6.4	8.4	6.4	5.05	6.8	7.5	4.11	4.41
12	4.30	6.3	5.65	8.3	7.7	9.1	6.5	5.0	6.3	6.4	3.93	4.35
13	3.68	5.5	5.2	9.5	8.1	7.8	7.0	4.9	5.85	6.1	5.55	4.55
14	4.02	5.75	4.8	8.4	7.5	10.3	7.3	4.9	5.6	5.8	6.2	4.04
15	4.08	5.5	4.37	7.5	6.6	10.0	12.0	4.8	5.3	5.75	5.5	4.00
16	3.81	5.4	4.02	7.1	6.3	9.5	9.9	5.05	5.1	6.7	4.48	3.97
17	3.53	4.95	4.7	6.8	6.0	8.8	9.1	6.1	5.2	6.0	4.41	4.10
18	3.99	5.2	5.2	6.5	6.0	7.4	8.2	7.5	4.9	6.0	4.08	4.55
19	4.03	5.05	5.05	6.3	6.4	7.2	7.3	6.8	4.7	5.9	4.53	5.0
20	5.75	4.85	4.8	6.3	5.9	6.6	7.0	6.3	4.55	7.0	6.4	4.37
21	4.75	5.05	5.0	6.7	6.3	6.4	6.8	6.2	4.5	7.4	5.6	6.5
22	4.5	5.05	5.05	7.2	6.5	6.2	6.4	6.8	4.65	6.3	4.55	8.2
23	5.0	4.47	5.0	7.1	7.1	6.1	6.2	6.8	5.1	6.0	4.85	7.4
24	7.2	4.95	5.2	7.8	6.2	6.4	5.95	11.0	5.0	5.75	7.4	7.2
25	6.7	4.85	5.1	9.4	6.3	5.85	5.85	9.4	5.1	7.3	6.2	6.5
26	6.1	4.55	5.3	8.8	6.1	6.0	5.6	8.1	6.6	6.6	5.75	5.15
27	5.85	4.36	5.5	8.3	6.2	10.2	6.5	10.3	6.7	5.75	5.5	4.85
28	5.25	4.5	5.7	7.8	6.6	11.5	7.8	12.6	5.9	5.6	5.1	4.27
29	5.3	4.25	5.6	7.0	.....	9.4	7.7	9.9	5.4	5.35	4.6	4.40
30	4.75	4.47	6.9	6.8	.....	8.3	8.3	8.9	5.25	5.15	4.28	4.5
31	5.0	.....	11.0	6.6	.....	7.8	.....	11.3	.....	4.85	4.38	.....

NOTE.—Observer made no notes concerning ice. Discharge relation probably not materially affected by ice during the year ending Sept. 30, 1913.

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GAULEY RIVER NEAR BELVA, W. VA.

Location.—Three-fourths mile below Chesapeake & Ohio Railway bridge at Belva, W. Va., one-fourth mile below the mouth of Twentymile Creek, and about 5½ miles above the mouth of river at Gauley bridge.

Records available.—August 25, 1908, to September 30, 1913.

Drainage area.—1,420 square miles.

Gage.—Vertical staff fastened to tree on right bank; read daily, morning and evening, to hundredths. Limits of use: Hundredths below 2.0, half-tenths from 2.0 to 3.5, and tenths above 3.5 feet. Sea-level elevation of the zero of the gage, 663.53 feet.

Control.—Practically permanent.

Discharge measurements.—Made from a boat 1,000 feet above gage, or by wading.

Floods.—No records of floods previous to installation of gage are available. Maximum gage height since installation of gage was approximately 19 feet, January 30, 1911.

Winter flow.—Discharge relation may be affected by ice at intervals during December, January, and February.

Accuracy.—Records of gage height accurate and reliable. Data insufficient for estimates of discharge.

No discharge measurements were made at this station during the year ending September 30, 1913.

Daily gage height, in feet, of Gauley River near Belva, W. Va., for the year ending Sept. 30, 1913.

[C. L. Davis, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.95	2.55	2.2	6.9	5.2	5.4	4.9	5.0	6.4	2.55	2.3	1.99
2	2.8	2.55	2.35	5.6	5.4	5.1	4.4	4.6	5.4	2.65	2.25	1.92
3	2.65	2.6	2.5	5.3	5.4	4.7	4.1	4.2	4.5	2.55	2.15	1.82
4	2.5	2.5	3.4	5.9	8.8	4.3	3.7	3.9	4.2	3.2	2.15	1.74
5	2.4	2.4	4.4	5.4	7.6	4.1	3.7	3.6	4.4	3.6	2.05	1.68
6	2.3	2.4	5.4	6.3	6.1	3.9	3.5	3.45	4.0	4.7	1.93	1.62
7	2.2	3.5	5.6	9.6	5.3	3.7	3.4	3.35	3.8	5.3	1.84	1.59
8	2.1	9.1	5.2	14.5	4.4	3.45	3.25	3.35	5.8	4.0	1.78	1.92
9	2.05	6.8	4.6	11.7	4.2	3.4	3.1	3.2	6.4	3.25	1.72	2.6
10	2.0	5.3	4.2	7.8	3.9	3.35	3.05	3.0	5.4	3.05	1.66	2.5
11	1.95	4.4	3.8	6.5	4.0	4.3	3.05	2.9	4.5	4.6	1.69	2.2
12	1.91	4.1	3.6	5.9	6.4	6.1	3.25	2.8	4.0	3.8	1.84	2.0
13	1.85	3.9	3.2	6.8	6.0	5.9	4.3	2.7	3.6	3.25	1.79	1.92
14	1.82	3.6	2.75	6.1	5.2	7.6	4.5	2.65	3.3	3.1	2.65	1.82
15	1.78	3.6	3.1	5.3	4.7	8.4	10.7	2.6	3.0	2.95	2.85	1.75
16	1.71	3.4	3.05	4.8	4.4	7.6	9.1	2.65	2.8	3.35	2.45	1.69
17	1.75	3.1	3.0	4.3	4.0	6.4	7.0	3.0	4.8	3.6	2.2	1.65
18	1.78	3.0	2.9	4.2	3.8	5.4	5.7	4.9	3.35	3.2	2.05	1.64
19	1.78	2.95	2.9	4.1	3.6	4.8	5.0	4.4	2.75	3.35	2.3	1.72
20	1.72	2.9	2.9	3.9	3.45	4.4	4.6	3.9	2.5	6.4	2.65	2.25
21	3.0	2.85	2.7	4.1	3.5	4.1	4.2	4.0	2.35	5.2	3.0	2.2
22	2.7	2.8	2.55	4.9	3.8	3.9	3.9	4.4	2.3	4.0	2.7	5.3
23	2.55	2.7	2.4	4.8	4.3	3.7	3.7	4.9	2.65	3.45	3.6	4.1
24	3.5	2.65	2.6	5.0	4.2	3.5	3.5	9.1	2.75	3.1	4.6	3.3
25	4.4	2.6	2.5	6.2	4.0	3.4	3.45	7.4	2.75	3.8	3.6	2.9
26	3.7	2.6	3.15	6.6	3.7	3.5	3.25	5.8	3.05	3.8	3.1	2.6
27	3.4	2.6	2.65	6.2	3.7	11.3	3.45	6.9	4.15	3.25	2.7	2.4
28	3.15	2.5	3.0	5.9	4.2	10.1	4.6	10.6	3.45	2.95	2.5	2.25
29	2.95	2.4	3.4	5.3	.....	7.0	4.9	8.1	2.95	2.85	2.3	2.15
30	2.75	2.3	4.5	4.8	.....	6.3	5.2	6.6	2.7	2.6	2.15	2.15
31	2.6	.....	9.2	4.7	.....	5.5	.....	7.3	.....	2.4	2.05	.....

NOTE.—Observer made no report concerning ice. Discharge relation probably not affected by ice during the year ending Sept. 30, 1913.

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CHERRY RIVER AT RICHWOOD, W. VA.

Location.—At the highway bridge at Richwood, W. Va., half a mile below junction of North and South forks.

Records available.—July 3, 1908, to September 30, 1913.

Drainage area.—Not measured.

Gage.—Standard chain gage attached to bridge; read daily, morning and evening, to half-tenths. Limits of use: Hundredths below 3.0, half-tenths from 3.0 to 4.0, and tenths above 4.0 feet.

Control.—Practically permanent. The removal of stones and bowlders from the river bed in the vicinity of the point of control has at times affected the relation of gage height to discharge. The first stones were removed during August, 1909, and more were removed during May, June, July, and August, 1911.

Discharge measurements.—Made from downstream side of bridge.

Point of zero flow.—A determination by leveling, August 16, 1910, indicates that there would be no flow past the gage if the river stage were to fall to 1.3 feet, ±0.2 foot.

Winter flow.—Discharge relation affected by ice at times during December, January, and February.

Accuracy.—See "Control." Data insufficient for estimates of discharge.

Daily gage height, in feet, of Cherry River at Richwood, W. Va., for the year ending Sept. 30, 1913.

[Floyd Artrip, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.40	2.38	2.22	3.05	3.05	3.2	2.94	2.97	3.45	2.76	2.19	2.12
2	2.36	2.43	2.32	2.92	2.98	3.05	2.84	2.90	3.15	2.39	2.39	2.04
3	2.33	2.36	2.82	3.05	3.15	2.86	2.71	2.77	2.90	3.1	2.26	2.04
4	2.28	2.30	2.79	3.05	3.6	2.76	2.68	2.65	2.90	2.84	2.16	2.04
5	2.23	2.28	3.05	2.95	3.25	2.74	2.61	2.57	2.70	2.49	2.12	1.99
6	2.23	2.28	3.25	3.65	3.0	2.68	2.61	2.55	2.60	3.8	2.06	1.94
7	2.20	4.6	3.2	5.1	2.88	2.51	2.56	2.55	2.87	2.96	2.04	1.96
8	2.18	4.1	3.05	5.1	2.91	2.51	2.51	2.45	3.05	2.66	2.04	2.05
9	2.16	3.4	2.82	4.0	2.81	2.54	2.46	2.40	2.95	2.52	1.99	2.19
10	2.13	3.05	2.72	3.5	2.66	2.66	2.46	2.35	2.77	3.3	1.99	2.04
11	2.08	2.89	2.67	3.35	2.94	3.75	2.48	2.30	2.67	2.86	1.96	1.94
12	2.08	2.75	2.52	3.5	3.35	3.4	3.0	2.30	2.57	2.72	2.22	1.94
13	2.06	2.67	2.47	3.3	3.0	3.25	3.0	2.25	2.47	2.59	2.76	1.94
14	2.10	2.72	2.52	3.1	2.91	4.8	2.96	2.25	2.40	2.49	2.52	1.94
15	2.08	2.65	2.47	2.95	2.76	3.9	4.6	2.27	2.35	3.0	2.26	1.94
16	2.08	2.55	2.42	2.85	2.66	3.55	3.6	2.43	2.30	2.82	2.22	1.89
17	2.03	2.52	2.37	2.75	2.61	3.2	3.25	3.05	2.25	2.59	2.14	2.21
18	2.03	2.47	2.37	2.72	2.51	2.98	3.05	2.93	2.20	2.52	2.04	2.45
19	2.03	2.47	2.39	2.67	2.48	2.84	2.95	2.75	2.15	4.6	2.69	2.21
20	2.66	2.45	2.29	2.62	2.66	2.76	2.83	2.63	2.13	3.75	2.82	2.13
21	2.46	2.42	2.27	2.79	2.91	2.74	2.70	2.67	2.15	3.05	2.49	3.8
22	2.38	2.37	2.29	2.77	3.2	2.68	2.65	2.65	2.20	2.76	3.25	3.1
23	3.1	2.37	2.35	2.75	3.15	2.58	2.57	3.45	2.45	2.64	3.65	2.68
24	2.70	2.32	2.27	3.3	2.98	2.56	2.55	3.95	2.27	2.64	2.89	2.48
25	2.66	2.32	2.32	3.35	2.76	2.56	2.50	3.3	2.25	3.1	2.66	2.33
26	2.63	2.27	2.42	3.2	2.74	2.84	2.47	3.05	3.05	2.72	2.54	2.25
27	2.63	2.27	2.37	3.1	2.88	5.7	3.05	4.6	2.57	2.56	2.39	2.23
28	2.58	2.25	2.37	2.91	3.5	3.9	3.05	4.5	2.45	2.44	2.29	2.28
29	2.53	2.19	2.39	2.78	.....	3.45	3.1	3.6	2.33	2.29	2.24	2.13
30	2.48	2.22	3.25	2.68	.....	3.2	3.25	3.35	2.25	2.29	2.19	2.21
31	2.40	.....	3.4	2.78	.....	3.05	.....	4.4	.....	2.24	2.14	.....

NOTE.—Observer made no notes concerning ice. Discharge relation probably affected by ice about Feb. 8 to 18, 1913.

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MEADOW RIVER NEAR RUSSELLVILLE, W. VA.

Location.—At Bays Ferry, 3 miles below Russellville, W. Va., one-fourth mile below mouth of Youngs Creek.

Records available.—July 17, 1908, to September 30, 1913.

Drainage area.—297 square miles.

Gage.—Standard chain gage attached to trees on left bank just above the bridge near former ferry crossing; read daily, morning and evening, to hundredths. Limits of use: Hundredths below 4.5, half-tenths from 4.5 to 5.5, and tenths above 5.5 feet.

Control.—Practically permanent.

Discharge measurements.—Made from a boat or by wading.

Winter flow.—Discharge relation at times affected by ice gorges.

Accuracy.—Gage-height records considered very reliable. In the fall backwater is sometimes caused at the gage by leaves lodging at the riffle below. Data insufficient for estimates of discharge. In October and November, 1912, the observer reported that the false work for the construction of the piers of the new county highway bridge below the gage was placed about the middle of October; that the piers were started October 28 and finished November 6. The bridge was completed in the spring of 1913.

No discharge measurements were made at this station during the year ending September 30, 1913.

Daily gage height, in feet, of Meadow River near Russellville, W. Va., for the year ending Sept. 30, 1913.

[J. R. Bays, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3.83	3.86	3.56	7.0	6.4	6.5	5.8	5.3	6.1	3.42	3.18	3.04
2	3.71	3.82	3.74	6.4	6.2	6.2	5.4	5.05	5.6	3.32	3.13	3.01
3	3.60	3.78	3.98	6.3	6.4	5.45	5.1	4.85	5.2	3.27	3.11	2.96
4	3.51	3.71	4.65	6.8	8.5	5.6	4.9	4.7	5.6	4.85	3.03	2.91
5	3.42	3.60	6.0	6.8	8.0	5.3	4.8	4.6	6.6	4.6	3.00	2.88
6	3.33	3.56	6.4	6.8	7.0	5.2	4.7	4.43	6.1	5.1	3.01	2.85
7	3.27	4.41	6.6	8.8	6.2	5.05	4.5	4.85	6.3	5.0	2.96	2.91
8	3.24	7.9	6.2	.....	7.7	4.75	4.41	4.75	7.2	4.31	2.93	2.97
9	3.19	6.9	5.6	8.9	7.4	4.65	4.32	4.6	7.2	3.91	2.90	3.07
10	3.15	5.9	5.15	7.5	6.6	4.9	4.26	4.45	6.5	3.82	2.85	3.10
11	3.12	5.45	4.9	7.2	6.5	6.6	4.22	4.33	5.7	3.82	.....	3.16
12	3.10	5.0	4.7	6.8	6.8	7.7	4.6	4.25	5.25	3.92	.....	3.10
13	3.10	4.75	4.55	6.6	7.5	7.1	5.6	4.19	4.9	3.80	3.71	3.05
14	3.12	4.65	4.35	6.4	7.5	8.3	5.6	4.12	4.6	3.63	3.40	2.97
15	3.15	4.55	4.33	6.0	7.3	10.1	a9.8	4.07	4.35	3.73	3.22	2.93
16	3.20	4.41	4.28	5.6	6.7	8.9	.....	4.05	4.19	3.92	3.22	2.89
17	3.27	4.29	4.23	5.35	5.3	7.5	7.4	5.0	4.14	4.10	3.18	2.91
18	3.24	4.22	4.17	5.2	4.8	6.6	6.5	5.6	4.27	3.96	3.15	2.95
19	3.44	4.14	4.14	5.1	4.7	6.0	5.9	5.2	3.81	3.89	3.22	3.23
20	4.46	4.07	4.07	5.05	4.65	5.5	5.3	4.95	3.67	6.0	3.26	3.37
21	4.41	4.02	3.97	5.2	4.75	5.3	5.1	6.8	3.59	5.6	3.11	3.71
22	4.20	3.96	3.83	5.45	5.1	5.1	4.9	6.6	3.59	5.1	3.54	5.5
23	4.41	3.93	3.80	5.4	5.3	4.85	4.75	6.8	3.63	4.28	4.29	4.7
24	5.1	3.90	3.76	6.0	5.35	4.75	4.6	.....	3.62	4.06	4.44	4.2
25	5.25	3.89	.....	6.9	5.25	4.7	4.48	7.6	3.59	3.98	3.92	3.71
26	4.85	3.87	3.79	6.8	5.0	5.15	4.43	6.7	3.90	3.80	3.60	3.61
27	4.7	3.82	3.91	6.6	5.05	8.5	4.7	8.0	3.87	3.68	3.40	3.43
28	4.26	3.70	3.98	6.5	6.05	10.4	5.2	.....	3.87	3.53	3.30	.....
29	4.20	3.46	3.96	6.3	.....	8.6	5.35	8.3	3.64	3.42	3.18	3.25
30	4.06	3.38	5.0	6.1	.....	7.4	5.4	7.3	3.53	3.35	3.10	3.40
31	3.94	.....	8.0	6.0	.....	6.5	.....	6.6	.....	3.26	3.04	.....

a Gage height estimated by observer.

NOTE.—Observer reported backwater from ice Feb. 8 and 9. Discharge relation affected by ice about Feb. 7 to 18, 1913.
Water too high for observer to reach gage Jan. 8 and Apr. 15–16.

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ELK RIVER AT WEBSTER SPRINGS, W. VA.

Location.—At suspension bridge on the grounds of the Webster Springs Hotel at Webster Springs, W. Va., one-fourth mile above the mouth of Back Fork Creek.

Records available.—July 1, 1908, to September 30, 1913.

Drainage area.—168 square miles.

Gage.—Vertical staff attached to right abutment of bridge; gage read daily, morning and evening, to hundredths. Limits of use: Hundredths below 3.0, half-tenths from 3.0 to 5.0, and tenths above 5.0 feet.

Control.—Practically permanent.

Discharge measurements.—Made from upstream side of bridge or by wading.

Point of zero flow.—Levels taken August 13, 1910, indicate that there would be no flow past the gage at a stage of 0.95 foot, ±0.2 foot.

Winter flow.—Discharge relation sometimes affected by ice.

Accuracy.—Data insufficient for estimates of discharge.

No discharge measurements were made at this station during year ending September 30, 1913.

Daily gage height, in feet, of Elk River at Webster Springs, W. Va., for the year ending Sept. 30, 1913.

[Cherry Woodzell, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.32	2.06	1.96	3.75	3.3	3.4	3.05	3.0	4.0	2.02	1.86	1.82
2	2.19	2.12	2.06	3.35	3.1	3.2	2.97	2.87	3.45	1.94	2.04	1.76
3	2.09	2.07	2.51	3.45	3.25	3.0	2.87	2.75	3.1	1.84	1.96	1.73
4	2.01	2.02	2.61	3.6	4.25	2.89	2.77	2.63	2.89	1.92	1.82	1.69
5	1.97	1.96	2.91	3.55	3.7	2.77	2.75	2.51	2.69	1.94	1.75	1.65
6	1.95	1.96	3.15	4.05	3.35	2.71	2.71	2.44	2.59	3.35	1.68	1.61
7	1.93	3.85	3.25	5.3	3.1	2.63	2.66	2.40	3.0	2.82	1.64	1.65
8	1.86	4.4	3.05	5.8	2.90	2.53	2.59	2.37	3.55	2.42	1.64	1.75
9	1.83	3.6	2.91	4.75	2.75	2.49	2.51	2.27	3.4	2.19	1.63	2.08
10	1.78	3.15	2.74	3.95	2.63	2.63	2.47	2.21	3.1	6.3	1.62	1.88
11	1.75	2.84	2.67	3.6	3.25	3.55	2.46	2.19	2.82	3.7	1.68	1.75
12	1.73	2.68	2.58	3.75	3.7	3.75	3.05	2.14	2.62	3.1	2.04	1.70
13	1.71	2.58	2.41	3.85	3.3	3.5	3.6	2.09	2.49	2.82	2.89	1.72
14	1.72	2.56	2.36	3.5	3.05	4.7	3.45	2.04	2.36	2.56	2.79	1.69
15	1.68	2.48	2.35	3.25	2.90	4.25	5.1	2.06	2.26	2.54	2.44	1.65
16	1.67	2.38	2.28	3.05	2.73	3.85	4.2	2.19	2.16	2.64	2.14	1.60
17	1.67	2.35	2.24	2.85	2.65	3.45	3.7	2.44	2.06	2.56	2.02	1.75
18	1.65	2.30	2.22	2.84	2.57	3.15	3.35	2.89	1.98	2.49	1.92	2.41
19	1.71	2.26	2.26	2.81	2.51	2.97	3.15	2.69	1.95	2.44	2.22	2.06
20	2.27	2.25	2.25	2.78	2.53	2.83	3.0	2.49	1.90	2.43	2.64	1.95
21	2.12	2.21	2.22	2.98	2.63	2.75	2.87	2.36	1.86	2.36	2.42	3.1
22	1.92	2.16	2.21	3.05	2.43	2.67	2.77	2.39	1.78	2.24	2.26	3.25
23	2.02	2.16	2.16	2.96	2.53	2.57	2.63	2.86	1.89	2.12	3.8	2.85
24	2.75	2.16	2.12	3.15	2.85	2.55	2.53	4.5	1.94	2.12	3.15	2.43
25	2.62	2.16	2.04	3.75	2.80	2.45	2.47	3.65	1.94	2.34	2.78	2.21
26	2.49	2.15	1.96	3.5	2.65	2.95	2.47	3.2	2.04	2.34	2.43	2.11
27	2.38	2.14	2.51	3.3	2.85	6.0	2.80	4.95	2.04	2.14	2.24	1.98
28	2.28	2.04	2.56	3.15	3.4	4.55	2.97	5.4	1.96	2.06	2.15	1.92
29	2.20	1.96	2.61	2.94	.....	3.85	3.15	4.25	2.14	1.98	2.05	1.87
30	2.15	1.96	3.9	2.84	.....	3.45	3.2	3.65	2.06	1.95	1.95	1.83
31	2.10	.....	4.35	3.15	.....	3.25	.....	5.3	.....	1.94	1.87	.....

NOTE.—Observer reported river frozen over, ice 2 to 5 inches thick, Dec. 23 and 28, 1912; and rain, ice gone out, Dec. 30. Discharge relation probably little, if at all, affected by ice during the year ending Sept. 30, 1913.

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ELK RIVER AT GASSAWAY, W. VA.

Location.—At the highway bridge immediately above the Coal & Coke Railroad bridge in the northeastern part of Gassaway, W. Va., just above the mouth of Little Otter Creek.

Records available.—July 1, 1908, to September 30, 1913.

Drainage area.—578 square miles.

Gage.—Standard chain gage attached to bridge; read daily, morning and evening, to hundredths. Limits of use: Hundredths below 3.0, half-tenths from 3.0 to 3.5, and tenths above 3.5 feet. Sea-level elevation of zero of gage, 796.31 feet. On May 5, 1913, the gage, which was then attached on the upstream side of the Coal & Coke Railroad bridge, was partly destroyed, and no gage-height records were taken until June 17, 1913, when the gage was changed to its present position, on the downstream side of the highway bridge. The datum of the gage was not changed, but on account of the slope of the water surface the gage heights at the new site are somewhat greater than the corresponding readings at the railroad bridge. It should be noted that Little Otter Creek enters between the bridges.

Control.—Probably permanent.

Discharge measurements.—Made from upstream side of bridge or by wading.

Floods.—No records of floods prior to the installation of the gage are available. The flood of January 30, 1911, reached a stage of 30.4 feet, as determined by wye levels on September 13, 1912.

Point of zero flow.—Determinations by leveling, August 12, 1910, and September 13, 1912, indicate that there would be no flow past the gage if the stage were to fall to 0.5 foot, ±0.2 foot.

Winter flow.—Ice may affect the discharge relation for short periods.

Accuracy.—Data insufficient for estimates of discharge.

Discharge measurements of Elk River at Gassaway, W. Va., in the year ending Sept. 30, 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 1	A. H. Horton	[a] 4.51	1,350
June 18	H. J. Jackson	[b] 2.14	232

[a] Gage height at old gage location. See "gage," station description.
[b] Gage height at new gage location. See "gage," station description.

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Daily gage height, in feet, of Elk River at Gassaway, W. Va., for the year ending Sept. 30, 1913.

[H. A. Hays, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3.05	1.96	1.86	7.5	3.6	3.9	4.8	5.0	.....	1.98	2.00	2.15
2	2.98	2.04	1.84	6.1	3.5	3.8	4.0	4.7	.....	1.94	2.00	2.09
3	2.80	2.31	1.84	6.4	3.7	3.7	3.8	4.1	.....	1.88	1.98	2.04
4	2.44	2.27	1.88	6.5	8.4	3.7	3.5	3.6	.....	1.85	1.95	1.80
5	2.10	2.23	2.02	6.2	7.6	3.6	3.5	.....	.....	1.90	1.86	1.74
6	2.02	2.19	3.8	6.4	6.7	3.7	3.45	.....	.....	1.98	1.78	1.62
7	1.96	2.12	3.9	11.6	5.4	3.8	3.35	.....	.....	2.29	1.70	1.63
8	1.94	5.0	3.8	17.4	4.9	3.8	3.25	.....	.....	2.46	1.67	2.19
9	1.88	6.0	3.15	13.1	3.9	3.7	3.05	.....	.....	2.58	1.66	3.2
10	1.84	5.3	2.99	8.3	3.6	3.6	2.70	.....	.....	9.9	1.64	2.90
11	1.79	3.9	3.10	6.4	4.3	4.6	2.81	.....	.....	7.8	1.70	2.54
12	1.75	3.35	2.94	5.7	9.0	6.5	3.1	.....	.....	7.7	2.51	2.09
13	1.72	3.05	2.94	4.4	6.2	7.3	4.4	.....	.....	8.1	4.7	2.08
14	1.71	2.98	2.70	3.8	5.7	8.1	4.7	.....	.....	7.2	4.6	2.32
15	1.70	2.94	2.41	3.4	5.4	8.0	5.7	.....	.....	4.4	3.5	2.39
16	1.70	2.90	2.49	3.8	4.9	7.6	7.3	.....	.....	3.9	2.72	2.12
17	1.69	2.88	2.38	4.3	4.0	7.3	6.0	.....	2.23	3.7	2.64	1.94
18	1.68	2.84	2.47	4.2	3.45	6.2	5.3	.....	2.20	3.3	2.41	2.38
19	1.70	2.81	3.7	3.9	3.35	4.5	5.1	.....	2.05	3.05	2.54	2.3
20	1.74	2.48	2.39	3.8	3.3	3.8	4.9	.....	1.98	2.96	4.7	3.7
21	1.92	2.27	2.20	4.0	3.3	3.8	4.3	.....	1.94	2.60	5.0	4.4
22	2.30	2.26	2.05	4.8	3.45	3.7	3.7	.....	1.98	2.56	5.2	6.8
23	2.48	2.24	1.98	5.6	3.45	3.6	3.5	.....	2.10	2.49	6.3	5.9
24	2.22	2.23	1.96	5.9	3.4	3.2	3.45	.....	2.02	2.46	5.7	4.8
25	2.10	2.22	1.96	6.2	3.35	2.78	3.4	.....	1.98	2.40	4.7	3.6
26	2.06	2.20	1.99	7.2	3.2	5.3	3.4	.....	2.12	2.36	3.8	2.52
27	2.04	2.18	2.12	6.9	3.1	13.9	3.5	.....	2.22	2.28	2.78	2.49
28	2.02	2.05	2.66	6.6	3.45	11.5	4.6	.....	2.14	2.22	2.44	2.46
29	2.00	1.88	3.6	6.2	.....	7.5	5.6	.....	2.08	2.10	2.39	2.40
30	2.10	1.86	5.1	5.1	.....	5.6	5.6	.....	2.02	2.07	2.30	2.30
31	2.02	.....	10.9	3.7	.....	5.2	.....	.....	.....	2.04	2.19	.....

NOTE.—Observer made no notes concerning ice. Discharge relation probably not affected by ice during year ending Sept. 30, 1913.

ELK RIVER AT CLENDENIN, W. VA.

Location.—At highway bridge in town of Clendenin, W. Va., immediately above mouth of Big Sandy Creek. Plate V, *A* (p. 94) gives a view looking upstream from the right bank just below the mouth of Big Sandy Creek; gage height, 6.0 feet; discharge about 3,400 second-feet.

Records available.—June 27, 1908, to September 30, 1913.

Drainage area.—Not measured.

Gage.—Standard chain gage attached to bridge; read daily, morning and evening, to hundredths. Limits of use: Hundredths below 3.0, half-tenths from 3.0 to 4.0, and tenths above 4.0. Sea-level elevation of zero of gage 588.69 feet.

Control.—Probably permanent.

Discharge measurements.—Made from downstream side of bridge or by wading.

Floods.—The high water of 1889 reached a stage of about 31.9 feet referred to gage datum.

Point of zero flow.—Levels taken August 11, 1910, and September 14, 1912, indicate that there would be no flow past the gage if the stage were to fall to 1.0 foot, ±0.2 foot.

Winter flow.—Ice may affect the discharge relation at times during December, January, and February.

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Accuracy.—Big Sandy Creek empties into Elk River immediately below the gage and affects the gage height. This effect may be negligible during periods of low water in the Big Sandy, but at other times the flow of the creek may be a large percentage of the flow in Elk River above the Big Sandy. On November 28, 1913, the station was visited by engineers of the Survey, who measured the flow and found it to be 29 per cent of the flow in Elk River above Big Sandy. In making estimates of discharge at this station the discharge and drainage area of Big Sandy Creek should be included; that is, the Clendenin gage should be considered as an index of the flow of Elk River just below the mouth of Big Sandy Creek. Discharge measurements at this station previously published do not include the flow of the Big Sandy and should therefore be used with caution.

No discharge measurements were made at this station during the year ending September 30, 1913.

Daily gage height, in feet, of Elk River at Clendenin, W. Va., for the year ending Sept. 30, 1913.

[J. W. Riley, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3.2	2.70	2.49	8.8	5.0	4.1	5.3	5.8	9.5	2.80	2.91	2.64
2	3.1	2.62	2.57	6.3	5.2	4.5	4.9	5.4	6.5	2.70	3.0	2.55
3	3.05	2.58	2.52	5.8	5.9	4.6	4.6	4.9	5.3	2.62	2.82	2.48
4	2.97	2.64	2.54	6.7	9.2	4.3	4.4	4.5	4.9	2.69	2.67	2.42
5	2.74	2.70	2.76	6.4	9.7	4.2	4.2	4.2	4.2	2.68	2.48	2.38
6	2.60	2.64	4.0	7.8	7.3	4.2	4.0	3.9	3.9	3.6	2.52	2.32
7	2.61	2.67	4.7	12.9	6.0	4.0	3.8	3.75	3.65	3.95	2.42	2.24
8	2.54	8.0	4.9	18.9	5.1	3.85	3.7	3.6	4.9	4.3	2.36	2.44
9	2.47	8.1	4.7	18.0	4.6	3.75	3.7	3.5	6.0	3.65	2.30	2.62
10	2.44	5.9	4.3	10.0	4.5	3.8	3.65	3.35	5.5	3.35	2.26	3.7
11	2.40	4.7	3.9	7.2	4.9	4.2	3.7	3.15	4.7	10.4	2.29	3.25
12	2.38	4.2	3.65	10.0	8.5	5.2	4.0	3.1	4.3	6.0	2.33	2.93
13	2.32	3.8	3.45	9.8	8.5	6.1	4.1	3.0	3.85	4.7	2.27	2.74
14	2.27	3.65	3.2	8.0	6.4	9.1	4.4	2.91	3.6	3.8	3.75	2.60
15	2.32	3.55	3.0	5.4	5.6	9.3	7.0	2.90	3.35	3.9	4.1	2.50
16	2.24	3.4	3.05	5.6	5.4	7.8	8.1	2.96	3.15	4.1	3.7	2.47
17	2.25	3.25	3.05	5.2	4.7	6.6	7.6	3.2	3.7	4.7	3.25	2.46
18	2.22	3.2	3.1	5.3	4.4	5.5	6.2	4.2	3.65	4.2	3.0	2.48
19	2.16	3.1	3.0	5.4	4.2	5.0	5.6	4.1	3.3	3.95	2.92	2.64
20	2.12	2.91	3.0	5.1	4.0	4.7	5.4	3.9	2.94	3.95	3.0	3.1
21	2.12	2.92	3.05	5.9	3.95	4.5	5.0	3.65	2.74	3.7	3.65	3.4
22	2.18	2.88	3.0	7.0	3.95	4.4	4.6	3.5	2.68	3.5	4.0	3.1
23	2.19	2.84	2.88	6.6	4.1	4.1	4.4	7.1	2.70	3.3	3.85	5.3
24	2.45	2.76	2.90	7.4	4.3	3.85	4.2	12.7	2.85	3.2	5.5	4.2
25	2.64	2.74	3.0	9.1	4.2	3.7	4.0	9.8	2.80	4.0	4.8	3.8
26	2.91	2.70	2.84	8.4	3.95	6.3	3.85	7.0	3.85	3.6	4.1	3.5
27	3.3	2.66	3.0	7.3	3.9	17.8	4.0	6.3	3.95	3.25	3.65	3.1
28	3.05	2.76	4.1	7.3	3.9	16.1	4.6	12.9	3.45	3.2	3.3	2.90
29	2.97	2.63	4.6	6.3	.....	9.5	5.5	11.6	3.15	3.0	3.05	2.80
30	2.84	2.55	5.7	5.6	.....	7.0	5.4	7.9	2.93	2.84	2.87	2.71
31	2.74	.....	10.7	5.2	.....	6.0	.....	7.0	.....	2.67	2.78	.....

NOTE.—Observer made no note concerning ice. Discharge relation probably not materially affected by ice during the year ending Sept. 30, 1913.

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COAL RIVER AT BRUSHTON, W. VA.

Location.—At Chesapeake & Ohio Railway bridge at Brushton, W. Va., 500 feet above the mouth of Brush Creek.

Records available.—June 23, 1908, to September 30, 1913.

Drainage area.—379 square miles.

Gage.—Standard chain gage attached to bridge; read daily, morning and evening, to hundredths. Limits of use: Hundredths below 2.5, half-tenths from 2.5 to 4.0, and tenths above 4.0 feet. Sea-level elevation of the zero of the gage, 633.83 feet.

Control.—Practically permanent. A change in channel causing a change in the discharge relation is indicated by the discharge measurement made September 17, 1912.

Discharge measurements.—Made from downstream side of bridge or by wading.

Winter flow.—The discharge relation is little, if at all, affected by ice.

Accuracy.—Gage-height records considered reliable. Data insufficient for estimates of discharge.

No discharge measurements were made at this station during the year ending September 30, 1913.

Daily gage height, in feet, of Coal River at Brushton, W. Va., for the year ending Sept. 30, 1913.

[G. W. Fitzpatrick, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.80	1.40	1.36	4.1	3.35	3.3	3.1	2.34	2.6	1.51	1.16	1.19
2	1.69	1.40	1.36	3.1	3.25	3.1	2.85	2.33	2.38	1.45	1.14	1.14
3	1.63	1.38	1.45	2.9	3.65	2.8	2.7	2.30	2.22	1.38	1.10	1.08
4	1.56	1.38	1.64	3.1	7.4	2.65	2.55	2.23	2.5	1.50	1.10	1.00
5	1.51	1.34	2.7	3.05	5.3	2.65	2.48	2.16	2.26	1.65	1.13	.95
6	1.46	1.33	3.55	3.6	4.1	2.55	2.34	2.12	2.10	1.90	1.10	.85
7	1.92	1.41	3.3	6.1	3.4	2.46	2.24	2.08	2.17	1.69	1.10	.92
8	1.88	2.55	2.9	9.6	3.05	2.34	2.20	2.24	4.4	1.56	1.13	1.37
9	1.82	2.9	2.55	6.5	2.8	2.34	2.16	2.38	4.7	1.43	1.06	1.52
10	1.56	2.42	2.32	4.5	2.6	2.46	2.11	2.20	3.6	1.50	1.02	1.40
11	1.34	2.16	2.14	3.6	2.7	2.6	2.20	2.06	2.95	1.34	1.00	1.30
12	1.30	2.02	2.07	3.7	3.9	3.35	2.18	1.96	2.6	1.36	1.08	1.23
13	1.28	1.90	1.89	4.4	3.9	3.4	2.20	1.90	2.40	1.46	1.13	1.20
14	1.25	1.84	1.72	4.0	3.5	4.8	2.23	1.87	2.20	1.44	1.18	1.20
15	1.25	1.81	1.78	3.45	3.15	5.4	6.4	1.82	2.08	1.46	1.32	1.16
16	1.24	1.74	1.81	3.1	2.95	4.6	4.5	1.77	1.98	1.60	1.34	1.16
17	1.22	1.66	1.76	2.8	2.75	3.9	3.8	2.22	1.94	1.52	1.31	1.16
18	1.28	1.60	1.72	2.9	2.6	3.35	3.35	2.42	3.0	1.68	1.24	1.18
19	1.24	1.56	1.72	2.9	2.48	3.05	3.15	2.40	2.6	2.04	1.22	1.19
20	1.26	1.53	1.74	2.9	2.40	2.9	2.95	2.20	2.22	2.05	1.32	1.16
21	1.24	1.48	1.75	3.6	2.33	2.55	2.65	2.15	2.02	1.90	1.27	1.15
22	1.24	1.44	1.60	4.1	2.31	2.65	2.55	2.34	2.44	1.76	1.24	1.14
23	1.52	1.43	1.45	3.8	2.24	2.5	2.46	3.1	1.91	1.63	1.32	1.16
24	1.61	1.42	1.50	3.9	2.21	2.40	2.42	5.5	1.83	1.54	1.30	1.19
25	1.78	1.43	1.54	5.1	2.24	2.36	2.34	4.2	1.78	1.46	1.58	1.30
26	1.78	1.46	1.52	4.8	2.18	3.05	2.30	3.4	1.70	1.40	1.52	1.26
27	1.67	1.44	1.71	4.3	2.27	11.8	2.34	3.05	1.70	1.36	1.43	1.26
28	1.61	1.42	1.84	5.0	3.25	7.0	2.34	3.45	1.77	1.33	1.39	1.19
29	1.56	1.38	2.14	4.3	.....	4.7	2.38	3.6	1.70	1.30	1.36	1.20
30	1.48	1.38	2.8	3.75	.....	3.85	2.35	3.15	1.61	1.24	1.29	1.37
31	1.44	.....	6.0	3.4	.....	3.45	.....	2.85	.....	1.21	1.22	.....

NOTE.—Observer made no notes concerning ice. Discharge relation probably affected by ice about Dec. 26–29, 1912, and Feb. 13–17, 1913.

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COAL RIVER AT FUQUA, W. VA.

Location.—At W. C. Hoy's passenger ferry, half a mile below Fuqua railroad station and 1 mile below the mouth of Fuqua Creek.

Records available.—October 12, 1911, to September 30, 1913.

Drainage area.—Not measured.

Gage.—Staff gage in two sections on right bank; read daily, morning and evening, to hundredths. Limits of use: Hundredths below 3.5, half-tenths from 3.5 to 4.0, and tenths above 4.0 feet.

Control.—Probably permanent.

Discharge measurements.—Made from boat 300 feet above gage or by wading.

Point of zero flow.—Wye levels, run September 16, 1912, indicate that there would be no flow past the gage if the river were to fall to a stage of 0.0 foot, ±0.2 foot referred to gage datum.

Winter flow.—Discharge relation probably affected by ice for short periods.

Accuracy.—Gage-height record considered reliable. Data insufficient for estimates of discharge.

No discharge measurements were made at this station during the year ending September 30, 1913.

Daily gage height, in feet, of Coal River at Fuqua, W. Va., for the year ending Sept. 30, 1913.

[W. C. Hoy, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.65	0.94	0.94	5.9	4.5	3.8	4.7	2.76	3.00	1.12	0.80	0.62
2	1.48	.94	1.00	3.95	4.1	3.7	4.1	2.73	2.59	1.05	.80	.59
3	1.32	.91	1.04	3.45	4.8	3.34	3.75	2.68	2.35	1.02	.76	.54
4	1.22	.92	1.10	3.65	12.8	3.05	3.5	2.58	2.88	1.06	.72	.52
5	1.14	.90	1.76	3.75	9.8	2.98	3.32	2.48	2.56	1.45	.68	.50
6	1.10	.88	4.2	4.3	6.6	2.92	3.13	2.46	2.10	1.48	.64	.48
7	1.04	.98	4.0	9.0	4.9	2.74	2.92	2.31	2.19	1.37	.64	.48
8	1.00	1.13	3.33	17.9	4.0	2.56	2.80	2.20	4.6	1.22	.62	.52
9	.95	2.67	2.80	13.7	3.6	2.46	2.70	2.50	6.5	1.12	.60	.68
10	.91	2.40	2.41	7.7	3.21	2.42	2.64	2.25	4.7	1.44	.60	.82
11	.90	1.97	2.16	5.4	3.38	2.66	2.60	2.10	3.48	1.17	.60	.74
12	.85	1.76	1.99	6.2	4.9	3.6	2.80	1.95	2.80	1.08	.58	.73
13	.83	1.60	1.95	6.9	5.6	4.0	2.90	1.85	2.48	1.04	.61	.72
14	.82	1.52	1.88	6.2	4.7	9.9	2.86	1.82	2.16	1.11	.59	.65
15	.80	1.47	1.85	4.8	4.2	10.1	9.5	1.77	1.95	1.10	.62	.62
16	.80	1.40	1.63	4.1	3.75	7.6	9.4	1.74	1.78	1.12	.72	.60
17	.79	1.34	1.56	3.6	3.40	5.7	6.7	2.11	1.70	1.27	.74	.60
18	.78	1.26	1.50	3.65	3.15	4.4	5.3	3.00	2.62	1.16	.70	.63
19	.75	1.20	1.50	3.8	2.87	3.85	4.6	2.72	2.53	1.97	.66	.66
20	.80	1.16	1.45	3.8	2.68	3.55	4.1	2.41	1.94	2.24	.62	.62
21	.80	1.12	1.40	4.9	2.59	3.42	3.6	2.30	1.66	1.70	.60	.60
22	.79	1.10	1.38	6.6	2.50	3.34	3.30	2.40	1.54	1.47	.70	.60
23	.99	1.07	1.30	5.9	2.41	2.95	3.18	5.1	1.54	1.29	.68	.58
24	1.04	1.05	1.26	6.2	2.34	2.78	3.02	9.3	1.50	1.38	.64	.58
25	1.12	1.06	1.35	8.8	2.32	2.72	2.85	7.2	1.40	1.20	.76	.58
26	1.22	1.06	1.18	8.5	2.22	6.6	2.75	5.0	1.36	1.11	.98	.62
27	1.25	1.06	1.43	6.9	2.25	18.5	2.83	4.0	1.28	1.02	.87	.61
28	1.15	1.04	1.60	8.3	3.00	14.9	2.84	3.6	1.26	.98	.80	.58
29	1.12	1.08	1.94	7.0	.....	9.0	2.86	4.5	1.26	.93	.76	.62
30	1.10	1.00	3.6	5.4	.....	6.5	2.87	4.0	1.18	.88	.70	.64
31	1.00	.....	9.2	4.5	.....	5.4	.....	3.42	.....	.84	.66	.....

NOTE.—Observer made no notes concerning ice. Discharge relation probably affected by ice about Dec. 25-29, 1912, and Feb. 13-18, 1913.

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POCOTALIGO RIVER AT SISSONVILLE, W. VA.

Location.—At the highway bridge at the post office at Sissonville, W. Va., one-fourth mile below the mouth of Grapevine Creek.

Records available.—June 26, 1908, to September 30, 1913.

Drainage area.—Not measured.

Gage.—Standard chain gage attached to bridge; read daily, morning and evening, to hundredths. Limits of use: Hundredths below 2.5, half-tenths from 2.5 to 3.5, and tenths above 3.5 feet.

Control.—Practically permanent.

Discharge measurements.—Made from downstream side of bridge or by wading.

Floods.—The flood of June 27, 1910, reached a height of 33.0 feet by the gage datum. Some of the flood water passed around the gage.

Winter flow.—Discharge relation may be affected by ice for short periods in December, January, and February.

Regulation.—A dam and small power plant above the station modify the low-water flow.

Accuracy.—Data insufficient for estimates of discharge.

No discharge measurements were made at this station during the year ending September 30, 1913.

Daily gage height, in feet, of Pocotaligo River at Sissonville, W. Va., for the year ending Sept. 30, 1913.

[B. N. Sisson, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.89	1.39	1.38	3.7	3.45	3.8	3.1	2.44	2.33	1.89	1.31	1.28
2	1.83	1.64	1.59	3.1	3.0	3.25	2.85	2.28	2.14	1.30	1.32	1.21
3	1.66	1.55	1.80	2.85	5.8	2.9	2.75	2.16	1.95	1.35	1.26	1.18
4	1.49	1.42	1.77	3.25	8.6	2.8	2.65	2.15	2.09	3.0	1.26	1.15
5	1.43	1.38	2.29	3.5	5.4	2.9	2.47	2.15	1.97	3.6	1.12	1.05
6	1.43	1.40	4.6	7.7	4.1	2.95	2.45	2.01	1.85	3.8	1.07	.99
7	1.41	1.44	3.9	12.9	3.35	2.85	2.35	1.92	2.5	3.35	1.06	.97
8	1.56	1.50	2.95	14.1	3.3	2.65	2.25	1.72	5.4	2.40	1.12	1.10
9	1.53	1.80	2.55	8.0	3.05	2.65	2.12	1.50	3.7	2.10	1.12	2.23
10	1.47	1.80	2.34	4.3	2.65	2.75	2.31	1.54	2.75	2.85	1.14	1.63
11	1.42	1.88	2.07	3.9	5.9	3.7	2.7	1.64	2.22	3.9	1.14	1.53
12	1.43	1.55	1.97	18.3	8.3	4.2	3.9	1.54	2.10	2.5	1.16	1.45
13	1.42	1.60	1.83	8.0	4.1	3.6	4.2	1.52	1.93	2.16	1.86	1.37
14	1.40	1.85	1.64	4.4	3.45	9.3	3.7	1.54	1.83	1.96	1.32	1.31
15	1.36	1.99	1.70	3.6	3.35	6.6	6.0	1.48	1.69	1.72	1.34	1.28
16	1.34	1.80	1.62	3.4	3.1	4.2	6.2	1.58	1.70	1.84	1.28	1.25
17	1.35	1.42	1.74	3.6	2.9	3.35	4.1	2.10	1.49	5.2	1.14	1.17
18	1.38	1.62	1.67	6.1	2.75	2.95	3.4	2.11	1.39	5.5	1.34	1.25
19	1.46	1.64	1.79	4.6	2.8	2.75	3.7	1.86	1.39	3.25	1.16	1.51
20	1.39	1.56	1.89	3.7	2.7	2.7	3.8	1.80	1.37	2.85	1.15	1.88
21	1.40	1.68	1.73	6.6	2.75	2.55	3.15	1.74	1.37	2.12	1.14	1.54
22	1.40	1.49	1.74	5.8	2.8	2.55	2.9	3.4	1.37	1.96	1.84	1.55
23	1.65	1.54	1.74	4.7	2.30	2.45	2.75	9.8	1.63	1.76	2.19	1.31
24	1.54	1.44	1.69	6.7	2.6	2.32	2.6	7.6	1.61	1.82	1.62	1.27
25	1.48	1.50	1.66	6.4	2.55	2.27	2.35	4.1	2.5	2.34	1.46	1.25
26	1.42	1.53	1.59	3.7	2.38	13.8	2.38	3.15	2.10	1.94	1.36	1.33
27	1.44	1.52	2.07	4.8	2.42	20.4	2.46	3.35	1.83	1.59	1.29	1.25
28	1.41	1.39	2.7	5.2	2.47	8.2	2.5	3.9	1.87	1.42	1.35	1.08
29	1.41	1.40	3.0	4.0	.....	4.6	2.6	3.45	1.67	1.62	1.36	1.18
30	1.38	1.39	7.1	3.45	.....	3.9	2.6	2.8	1.57	1.62	1.28	1.21
31	1.40	.....	6.9	3.25	.....	3.45	.....	2.6	.....	1.42	1.23	.....

NOTE.—Observer made no notes concerning ice. Discharge relation probably not affected by ice during the year ending Sept. 30, 1913.

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MILL CREEK BASIN.

MILL CREEK AT ARLINGTON HEIGHTS, OHIO.

Location.—At Arlington Heights, about 1,000 feet below confluence of East and West forks of Mill Creek.

Records available.—September 19, 1912, to September 30, 1913.

Drainage area.—109 square miles.

Gage.—Inclined staff fastened to posts on right bank; read daily, morning and evening, to half-tenths.

Control.—Probably permanent.

Discharge measurements.—Made from boat at section or at low water by wading both forks.

Winter flow.—Affected by ice during severe winters.

Accuracy.—Gage-height record considered reliable. Data insufficient for estimates of discharge.

Cooperation.—Station maintained in cooperation with the division of sewerage of the city of Cincinnati, Ohio.

The following discharge measurement was made by wading by Bailey and Root: October 16, 1912: Gage height, 1.41 feet; discharge, 18.1 second-feet.

Daily gage height, in feet, of Mill Creek at Arlington Heights, Ohio, for the year ending Sept. 30, 1913.

[H. C. Harris, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.52	1.55	1.42	1.72	1.95	2.70	.....	1.45	1.38	1.20	1.20	1.20
2	1.55	1.50	1.65	1.82	1.92	2.10	.....	1.40	1.30	1.20	1.20	1.20
3	1.55	1.48	1.58	2.48	1.90	2.05	.....	1.40	1.30	1.22	1.20	1.20
4	1.55	1.42	1.50	1.80	1.70	2.45	.....	1.40	1.30	1.40	1.20	1.20
5	1.55	1.42	1.55	2.40	1.48	2.20	.....	1.35	1.25	1.20	1.20	1.20
6	1.48	1.48	2.20	4.08	1.40	2.05	.....	1.32	1.28	1.20	1.20	1.20
7	1.45	2.00	1.58	3.65	1.42	1.65	.....	1.32	1.40	1.20	1.20	2.70
8	1.48	1.78	1.58	4.00	1.50	1.90	.....	1.30	1.30	1.20	1.25	1.20
9	1.50	1.70	1.52	2.55	1.60	1.98	.....	1.30	1.28	1.20	1.20	1.20
10	1.50	2.05	1.48	3.70	1.62	1.88	.....	1.25	1.30	1.25	1.40	1.20
11	1.50	1.55	1.48	7.15	1.72	1.98	.....	1.22	1.25	1.35	1.25	1.20
12	1.50	1.55	1.42	5.00	1.75	1.85	.....	1.25	1.20	1.25	1.20	1.22
13	1.45	1.58	1.32	2.80	1.68	1.80	.....	1.25	1.18	1.30	1.20	1.20
14	1.40	1.55	1.28	2.50	1.50	2.92	.....	1.75	1.20	1.20	1.20	1.20
15	1.50	1.52	1.42	3.72	1.62	2.15	.....	1.40	1.20	1.25	1.25	1.20
16	1.42	1.55	1.42	6.15	1.82	1.95	.....	2.50	1.20	1.20	1.25	1.20
17	1.42	1.60	1.72	6.55	1.72	1.85	.....	1.45	1.20	1.20	1.25	1.20
18	1.55	1.52	1.68	3.25	1.78	1.80	.....	1.35	1.20	1.20	2.80	1.18
19	1.62	1.50	1.68	2.45	1.82	1.80	.....	1.30	1.20	1.20	1.25	1.25
20	1.42	1.55	1.58	3.72	1.90	1.80	.....	1.35	1.15	1.20	1.20	1.20
21	1.45	1.52	1.48	3.85	1.95	2.12	.....	1.40	1.18	1.15	1.20	1.35
22	1.80	1.48	1.32	3.50	2.00	1.82	.....	1.40	1.15	1.20	1.20	1.18
23	1.98	1.48	1.38	5.65	1.72	1.90	.....	1.40	1.18	1.22	1.20	1.20
24	1.65	1.48	1.40	3.10	1.58	4.88	.....	1.35	1.25	1.25	1.20	1.22
25	1.60	1.42	1.38	2.55	1.70	7.40	1.50	1.40	1.20	1.20	1.20	1.20
26	1.52	1.58	1.48	2.30	1.88	.....	1.55	1.35	1.22	1.20	1.20	1.20
27	1.40	1.48	1.58	2.10	3.90	.....	1.52	1.40	1.18	1.65	1.20	1.18
28	1.40	1.40	1.48	2.00	2.85	.....	1.60	1.35	1.20	1.20	1.22	1.25
29	1.48	1.42	1.52	1.95	.....	.....	1.60	1.30	1.18	1.20	1.25	1.20
30	1.50	1.40	1.72	2.05	.....	.....	1.52	1.30	1.18	1.20	1.20	1.20
31	1.52	.....	1.82	1.95	.....	.....	.....	1.35	.....	.....	1.20	.....

NOTE.—Observer made no notes concerning ice. Discharge relation probably not materially affected by ice during the year ending Sept. 30, 1913.

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MILL CREEK AT CINCINNATI, OHIO.

Location.—At the Eighth Street Viaduct, Cincinnati, Ohio, about three-eighths of a mile above mouth of Mill Creek.

Records available.—September 10, 1912, to September 30, 1913.

Drainage area.—154 square miles.

Gage.—Standard chain gage attached to bridge; read daily, morning and evening, to hundredths.

Control.—Permanent.

Discharge measurements.—Made from upstream side of bridge or by wading at the same section.

Winter flow.—Affected by ice during severe winters.

Accuracy.—For greater part of year gage heights are affected by backwater from Ohio River; therefore estimates of flow can not be made.

Cooperation.—Station maintained in cooperation with the division of sewerage of the city of Cincinnati, Ohio, for use in connection with its sewerage studies.

Discharge measurements of Mill Creek at Cincinnati, Ohio, in the year ending Sept. 30, 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Jan. 8	Root and Zull	27.65	1,490
23	....do	35.71	5,170

Daily gage height, in feet, of Mill Creek at Cincinnati, Ohio, for the year ending Sept. 30, 1913.

[Wm. Manning, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	5.19	6.89	2.79	2.34	26.24	10.38	.....	17.12	35.23	2.64	2.95	.....
2	5.53	5.59	2.97	3.95	20.26	12.59	.....	17.12	34.32	2.70	2.95	.....
3	4.63	3.73	2.57	8.12	27.46	16.44	.....	17.01	34.34	2.76	2.84	.....
4	3.67	2.47	2.81	9.13	26.20	17.76	.....	18.60	36.81	3.15	2.84	.....
5	2.06	1.81	3.22	21.74	24.80	18.00	.....	19.50	35.65	3.04	2.74	.....
6	1.96	2.04	3.53	22.86	23.61	17.71	41.09	18.90	33.37	3.17	2.60	.....
7	1.62	2.38	2.15	28.11	27.51	8.99	38.39	18.41	29.98	3.16	3.10	.....
8	1.74	2.18	1.95	28.05	20.07	14.29	33.78	17.88	33.98	2.98	4.63	.....
9	1.78	2.06	2.21	.....	18.77	17.17	24.07	16.96	24.01	2.79	3.91	.....
10	1.78	1.96	6.12	43.72	15.85	15.29	29.95	16.94	19.74	3.28	3.86	.....
11	1.84	2.35	9.50	40.94	18.46	8.59	28.19	15.82	19.86	3.43	3.91	.....
12	2.45	2.94	7.31	50.44	12.64	8.57	27.85	16.96	19.72	3.44	3.92	2.85
13	2.91	5.10	6.77	50.39	17.88	8.69	25.37	16.95	18.92	3.48	3.94	2.83
14	2.67	6.86	5.89	.....	18.27	9.56	33.82	16.24	19.90	3.50	3.93	2.83
15	2.67	5.51	4.81	.....	18.19	13.12	23.41	14.82	11.93	3.24	3.93	2.83
16	2.42	4.69	3.52	.....	15.47	28.88	25.16	13.22	11.93	4.82	3.93	2.84
17	2.47	3.09	2.08	.....	18.67	25.18	33.28	13.21	19.27	5.22	2.89	2.84
18	2.69	2.29	1.87	.....	18.07	30.68	35.78	14.94	11.89	5.68	3.94	2.84
19	2.31	1.89	1.81	.....	17.12	38.02	35.00	17.85	11.94	5.88	3.92	2.84
20	2.43	1.89	.94	.....	16.48	31.34	34.70	12.93	11.93	5.04	3.93	2.84
21	2.39	1.89	1.81	39.37	14.44	28.75	14.88	13.28	11.93	3.69	3.94	2.84
22	3.27	1.83	1.79	35.85	12.94	26.87	13.35	13.35	11.93	2.98	3.95	2.84
23	2.43	1.83	1.79	35.92	13.77	23.30	22.16	13.58	11.93	2.88	3.94	2.84
24	2.80	1.79	1.81	35.65	10.21	28.90	21.12	13.79	11.93	2.64	3.95	2.84
25	2.26	1.82	1.34	36.71	16.64	27.08	25.76	13.88	11.93	2.64	3.94	2.84
26	2.58	1.96	1.84	35.71	14.42	47.68	29.36	23.24	11.94	2.64	2.93	2.83
27	2.42	2.12	1.88	35.19	17.49	57.80	19.22	26.19	.....	2.95	2.93	2.83
28	3.44	2.29	1.84	34.77	21.03	66.22	18.88	26.20	.....	2.95	.....	2.84
29	4.57	2.48	1.84	30.31	.....	.....	18.20	34.64	.....	2.95	.....	2.84
30	7.29	2.58	2.67	29.34	.....	.....	17.26	36.98	2.70	2.95	.....	2.84
31	8.01	.....	2.33	27.64	.....	.....	.....	36.33	.....	2.95	.....	.....

NOTE.—Observer made no notes concerning ice. Discharge relation probably not affected by ice during the year ending Sept. 30, 1913. Backwater from Ohio River was reported by observer Sept. 10–12 and 23–30; Oct. 1–4, 12–31; Nov. 1–20, 27–30; Dec. 1–4, 10–16; Jan. 5–6, 14–21; May 26; June 1–6; July 17–22; Aug. 1–4 and 8–27.

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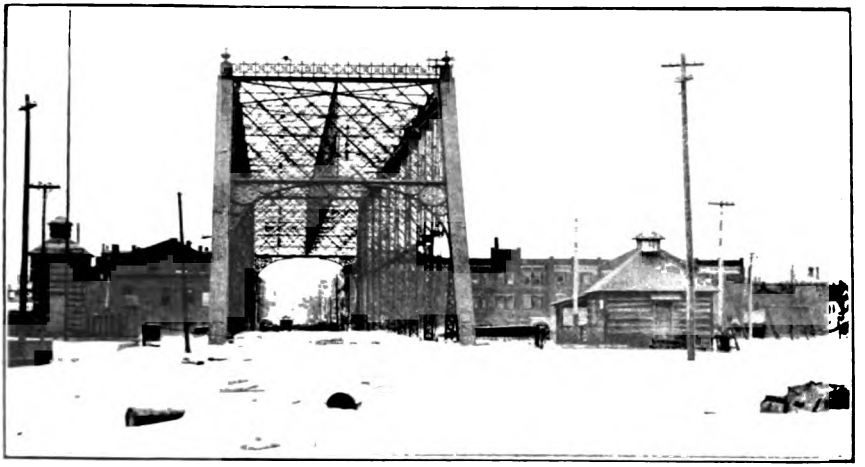
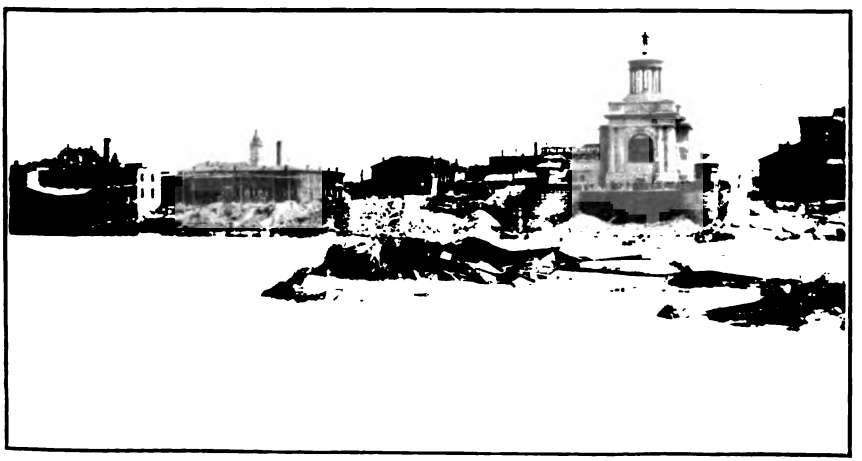


A.

B.



C.

HIGH STREET BRIDGE OVER MIAMI RIVER AT HAMILTON, OHIO, MARCH-APRIL, 1913.

A, *B*, Before failure; *C*, View from right bank below bridge, showing part of the remains of the bridge. The United States Geological Survey gage was located near this bridge. Measurements of discharge were made from the bridge.

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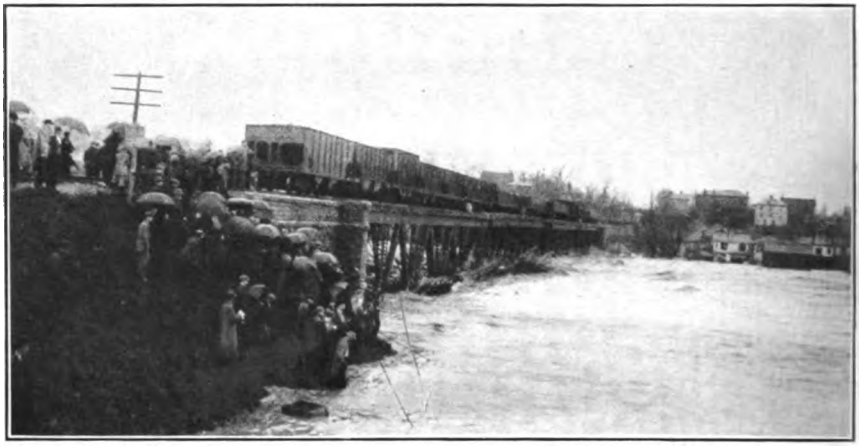
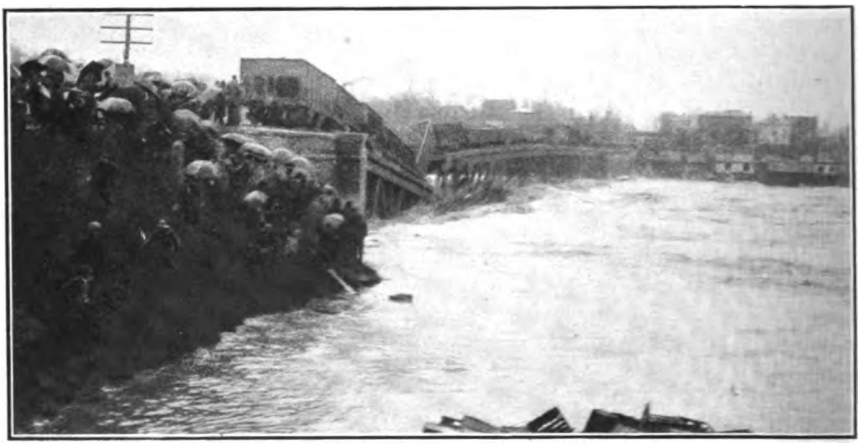


A. JUST BEFORE FAILURE.



B. DURING FAILURE.

C. IMMEDIATELY AFTER FAILURE.

CINCINNATI, HAMILTON, & DAYTON RAILROAD BRIDGE OVER MIAMI RIVER AT HAMILTON, OHIO, MARCH 25, 1913.

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MIAMI RIVER BASIN.

MIAMI RIVER AT HAMILTON, OHIO.

Location.—A single-span highway bridge on High Street, Hamilton, Ohio.

Records available.—February 28, 1910, to September 30, 1913. Flood stages only, November 16, 1904, to February 27, 1910, reported by the United States Weather Bureau.

Drainage area.—3,580 square miles.

Gage.—Prior to the flood of March-April, 1913, a vertical staff gage in two sections fastened to the retaining wall on the left bank of the river about 100 feet above the bridge; upper section, placed by Weather Bureau in November, 1904, read from 2.5 to 25.0 feet; lower section, placed by the United States Geological Survey, extended from 0.5 to 4.0 feet. This gage was destroyed by the flood on March 26, 1913, and was replaced by the county surveyor April 22, 1913. The present gage reads from 0.0 to 9.2 feet and is attached to the south side of the temporary bridge located about 100 feet below the old gage site. Gage heights for stages above 9.2 feet are determined by measuring the distance from the water surface to a bench mark on the floor of the bridge. Gage datum has not been changed. Gage read daily, morning and evening, to half tenths. Limits of use: Hundredths below 1.5, half tenths from 1.5 to 3.0, and tenths above 3.0 feet.

Control.—Apparently permanent under ordinary conditions. The section at the bridge shifts to some extent in floods on account of the high velocity.

Discharge measurements.—Made from upstream side of bridge.

Floods.—The maximum stage on record at this station occurred at 3 a. m. March 26, 1913, at gage height 34.6 feet.[1] (See Pls. III, IV.) The highest stage prior to 1913 was 21.2 feet March 24, 1898, according to the records of the United States Weather Bureau.

Winter flow.—During very severe weather the discharge relation is at times affected by ice, but for short periods only, as factory wastes probably keep the temperature of the water above the freezing point.

Regulation.—There are several power plants in Hamilton above the station, but all the water is returned to the river above the gage.

Diversions.—The Miami & Erie Canal is fed by water taken from Miami River at Middletown and Miamisburg, Ohio. The quantity diverted is not known, but it is believed to be a considerable part of the low-water flow.

Accuracy.—Values of "discharge in second-feet per square mile" and "run-off (depth in inches)" published for this station in previous reports may be misleading and should be used with caution, if at all. See "Regulation" and "Diversions." The discharge relation was materially changed by the flood of March-April, 1913, and as no discharge measurements have been made at this station since March 11, 1913, estimates of discharge subsequent to March 25, 1913, have not been prepared.

The following discharge measurement was made by W. R. King:

March 11, 1913: Gage height, 3.42 feet; discharge, 5,300 second-feet.

[1] For information relating to this flood see U. S. Geol. Survey Water-Supply Paper 334.

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Daily gage height, in feet, of Miami River at Hamilton, Ohio, for the year ending Sept. 30, 1913.

[C. A. Huber, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.55	1.6	1.6	2.0	3.7	5.2	.....	3.8	3.6	2.95	2.7	2.55
2	1.5	1.6	1.5	1.9	3.4	4.0	.....	3.8	3.5	2.9	2.65	2.5
3	1.5	1.5	1.5	2.4	3.2	3.3	[a]7.0	3.8	3.5	2.9	2.65	2.5
4	1.5	1.5	1.5	2.25	3.0	3.2	[a]13.0	3.8	3.6	2.9	2.6	2.5
5	1.5	1.5	1.5	2.1	2.85	3.2	11.0	3.7	3.5	2.85	2.6	2.45
6	1.5	1.5	1.5	3.2	2.65	3.4	.....	3.6	3.4	2.8	2.55	2.45
7	1.5	2.0	1.5	4.9	2.5	3.3	6.3	3.6	3.6	2.8	2.55	2.45
8	1.5	1.9	1.5	9.2	2.5	3.2	5.3	3.6	3.6	2.8	2.5	2.6
9	1.5	1.8	1.5	8.4	2.5	3.1	5.5	3.6	3.6	2.8	2.5	2.5
10	1.5	1.8	1.5	5.6	2.5	3.0	.....	3.5	3.5	2.8	2.5	2.45
11	1.5	1.7	1.5	7.8	2.5	3.3	.....	3.4	3.4	2.9	2.6	2.45
12	1.5	1.7	1.5	9.7	2.5	3.7	.....	3.3	3.2	3.0	3.0	2.45
13	1.5	1.7	1.5	8.0	2.45	3.4	.....	3.2	3.2	2.9	3.0	2.45
14	1.5	1.7	1.5	5.8	2.3	4.7	.....	3.5	3.2	2.9	2.85	2.45
15	1.5	1.7	1.5	4.4	2.3	4.4	.....	3.5	3.2	3.1	2.75	2.4
16	1.5	1.7	1.5	5.0	2.3	3.8	.....	3.5	3.1	3.1	2.7	2.4
17	1.5	1.7	1.5	10.0	2.2	3.3	.....	3.5	3.0	3.1	2.65	2.5
18	1.5	1.7	1.5	9.8	2.1	3.0	.....	3.4	3.0	3.1	2.65	2.5
19	1.5	1.7	1.5	7.2	2.25	2.95	.....	3.4	2.95	3.1	2.8	2.5
20	1.5	1.7	1.5	5.2	2.35	2.8	.....	3.3	2.9	3.1	2.8	2.5
21	1.5	1.7	1.5	8.9	2.4	3.0	.....	3.3	2.9	3.0	2.8	2.5
22	1.5	1.6	1.5	7.7	2.4	3.0	4.0	3.2	2.9	3.0	2.8	2.5
23	2.0	1.6	1.5	9.4	2.4	3.0	4.0	3.2	2.9	2.95	2.8	2.5
24	1.8	1.6	1.5	9.0	2.35	8.5	4.0	3.2	3.4	2.9	2.75	2.5
25	1.8	1.6	1.5	6.6	2.25	19.7	3.9	3.2	3.3	2.9	2.7	2.45
26	1.8	1.6	1.5	5.3	2.1	[b]34.6	3.9	3.2	3.1	2.85	2.7	2.45
27	1.7	1.6	1.5	4.5	3.5	25.0	3.9	3.8	3.0	2.85	2.65	2.45
28	1.7	1.6	1.5	4.0	5.8	19.2	3.9	5.8	3.0	2.85	2.65	2.45
29	1.7	1.6	1.5	3.8	.....	14.8	3.9	4.4	3.0	2.8	2.6	2.45
30	1.7	1.6	2.4	3.6	.....	.....	3.8	4.0	3.0	2.75	2.6	2.45
31	1.6	.....	2.35	3.7	.....	.....	.....	3.8	.....	2.7	2.55	.....

[a] Gage height approximate. [b] Crest stage.

NOTE.—Observer made no notes concerning ice. Discharge relation probably not affected by ice during the year ending Sept. 30, 1913. Gage heights Mar. 26–29 determined by wye levels from marks on concrete coping; Apr. 3 and 4 estimated; Apr. 5, by levels from bench mark; and Apr. 7–9, from temporary gage which was destroyed Apr. 10. See station description.

Daily discharge, in second-feet, of Miami River at Hamilton, Ohio, for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
1	860	920	920	1,660	6,230	11,100	16	800	1,070	800	10,400	2,330	6,540
2	800	920	800	1,450	5,330	7,160	17	800	1,070	800	29,400	2,100	5,030
3	800	800	800	2,560	4,730	5,030	18	800	1,070	800	28,500	1,880	4,150
4	800	800	800	2,220	4,150	4,730	19	800	1,070	800	18,100	2,220	4,000
5	800	800	800	1,880	3,720	4,730	20	800	1,070	800	11,100	2,440	3,580
6	800	800	800	4,730	3,180	5,330	21	800	1,070	800	24,800	2,560	4,150
7	800	1,660	800	10,100	2,800	5,030	22	800	920	800	20,000	2,560	4,150
8	800	1,450	800	26,000	2,800	4,730	23	1,660	920	800	26,900	2,560	4,150
9	800	1,250	800	22,800	2,800	4,440	24	1,250	920	800	25,200	2,440	23,200
10	800	1,250	800	12,400	2,800	4,150	25	1,250	920	800	15,900	2,220	78,800
11	800	1,070	800	20,400	2,800	5,030	26	1,250	920	800	11,400	1,880	.....
12	800	1,070	800	28,100	2,800	6,230	27	1,070	920	800	8,760	5,630	.....
13	800	1,070	800	21,200	2,680	5,330	28	1,070	920	800	7,160	13,100	.....
14	800	1,070	800	13,100	2,330	9,410	29	1,070	920	800	6,540	.....	.....
15	800	1,070	800	8,440	2,330	8,440	30	1,070	920	2,560	5,930	.....	.....
							31	920	.....	2,440	6,230	.....	.....

NOTE.—Daily discharge, Oct. 1, 1912, to Mar. 25, 1913, determined by means of a discharge rating curve that is fairly well defined below 210 second-feet (gage height, 0.6 foot), well defined between 250 and 66,500 second-feet (gage heights, 0.7 and 17.5 feet), and is a tangent above 62,600 second-feet (gage height, 16.8 feet), and extended as such above 66,500 second-feet (gage height, 17.5 feet).

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Monthly discharge of Miami River at Hamilton, Ohio, for the year ending Sept. 30, 1913.

[Drainage area, 3,580 square miles.]

Month.	Discharge in second-feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
October	1,660	800	912	B.
November	1,660	800	1,020	B.
December	2,560	800	914	B.
January	29,400	1,450	14,000	B.
February	13,100	1,890	3,410	B.

NOTE.—See "Accuracy" in station description.

KENTUCKY RIVER BASIN.

DIX RIVER NEAR BURGIN, KY.

Location.—At highway bridge on Burgin-Buena Vista Pike, 4 miles from Burgin, Ky.

Records available.—July 2, 1910, to July 16, 1911; October 1, 1911, to September 30, 1913.

Drainage area.—416 square miles.

Gage.—Staff gage attached to abutment of bridge; read once daily to tenths.

Control.—Probably permanent. See "Accuracy."

Discharge measurements.—See "Cooperation."

Winter flow.—Discharge relation ordinarily not affected by ice.

Accuracy.—Station has not been visited by United States Geological Survey engineers, who have, however, computed daily and monthly discharge. No discharge measurements were made during the year ending September 30, 1913. The station was last visited September 30, 1910, and the accuracy of the data published in the following tables depends upon the permanency of the gage and of the conditions of flow since that date. On January 10, 1913, the gage was washed out and was replaced by the observer on February 15. It was probably set in its original position, as the lower end rests on top of a rock ledge. On the assumption that any error in replacing the gage would not be likely to be the same as a change in the discharge relation caused by a change in the control, the soundings made by the observer on April 4, 1913, indicate that the gage is correct within a tenth of a foot and that there has been no change in the cross section of the river at the gage since July 21, 1910. These soundings indicate that there has probably been no material change in the discharge relation as expressed by the rating curve developed prior to 1911.

Cooperation.—Station was established and measurements made by representatives of the Kentucky Geological Survey and the Madison Electric & Power Co., of Richmond, Ky.

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Daily gage height, in feet, of Dix River near Burgin, Ky., for the year ending Sept. 30, 1913.

[C. P. Kennedy, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3.2	2.8	3.3	8.7	7	8.0	6.3	5.1	6.1	3.3	2.8	2.7
2	3.2	2.9	3.4	8.3	7	7.3	6.0	4.9	5.9	3.3	2.8	2.7
3	3.2	2.9	4.2	7.8	6	6.6	5.5	4.9	6.9	4.1	2.8	2.7
4	3.2	3.0	4.5	7.9	7	5.4	5.1	4.9	6.1	3.9	3.0	2.7
5	3.1	3.3	5.0	7.9	8	5.4	5.2	4.8	5.7	3.6	3.0	2.7
6	3.1	3.4	12.2	11.6	9	5.3	5.1	4.7	5.4	3.4	2.8	2.7
7	3.0	3.6	8.9	26.0	8	5.4	5.1	4.5	5.0	3.3	2.8	2.7
8	3.0	3.6	6.9	28.9	7	5.5	5.0	4.3	4.7	3.3	2.8	2.7
9	3.0	3.8	5.8	22.3	7	5.4	5.0	4.1	4.3	3.3	2.8	2.7
10	3.0	4.7	5.5	[a] 17	6	5.3	5.4	4.1	4.1	3.3	2.8	2.7
11	3.0	4.6	5.4	13	8	5.2	5.5	3.9	4.0	3.2	2.8	2.7
12	3.0	4.5	5.4	26	7	5.0	5.5	3.9	4.0	3.2	2.8	2.7
13	3.0	4.4	5.2	19	6	5.7	5.3	3.9	3.8	3.1	2.8	2.7
14	3.0	4.3	5.2	13	[a] 6	13.4	5.2	3.9	3.6	3.0	2.8	2.7
15	2.9	4.1	5.1	10	5.3	10.2	4.9	3.8	3.5	2.8	2.8	2.7
16	2.9	3.8	5.1	8	5.3	7.7	4.8	3.8	3.3	2.8	2.8	2.7
17	2.9	3.8	5.0	8	5.2	6.0	4.6	3.8	3.3	2.8	2.8	2.7
18	2.9	3.8	5.0	12	5.2	5.8	4.5	3.7	3.3	2.8	2.8	2.7
19	2.9	3.8	5.0	10	5.2	5.7	4.3	3.7	3.3	2.8	2.8	2.7
20	2.9	3.8	5.0	10	5.2	5.5	4.1	3.9	3.3	2.8	2.9	2.7
21	2.9	3.7	4.9	12	5.2	5.4	4.0	4.6	3.2	2.8	3.6	2.7
22	2.9	3.6	4.9	11	5.2	6.8	4.0	7.7	3.3	2.8	3.6	2.7
23	2.9	3.6	4.9	10	5.1	6.7	4.0	7.3	3.3	2.8	4.5	2.7
24	2.9	3.5	4.9	17	5.1	6.5	3.9	8.2	8.0	2.8	4.5	2.7
25	2.9	3.4	4.8	13	5.6	6.6	4.0	6.8	5.8	2.8	4.2	2.7
26	2.9	3.4	4.8	11	6.3	24.5	4.4	6.6	5.1	2.8	4.0	2.7
27	2.8	3.3	4.8	10	8.0	27.6	5.6	6.5	4.1	3.4	3.6	2.7
28	2.8	3.3	5.4	9	8.8	15.6	6.7	6.5	3.8	3.2	3.3	2.7
29	2.8	3.3	5.8	9	.....	9.8	5.7	6.5	3.5	3.0	3.0	2.7
30	2.8	3.3	5.8	8	.....	8.5	5.7	6.4	3.4	3.0	2.8	2.7
31	2.8	.....	9.2	7	.....	7.1	.....	6.4	.....	2.8	2.7	.....

[a] Gage washed out; gage heights estimated by observer Jan. 10 to Feb. 14.

NOTE.—No ice reported. Discharge relation probably not affected by ice. See "Accuracy" in station description.

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Daily discharge, in second-feet, of Dix River near Burgin, Ky., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.a
1	41	15	50	2,500	1,300	1,950	927	452	830	50	15	.....
2	41	20	60	2,180	1,300	1,480	786	388	744	50	15	.....
3	41	20	195	1,800	786	1,080	590	388	1,240	172	15	.....
4	41	26	270	1,880	1,300	554	452	388	830	132	26	.....
5	33	50	420	1,880	1,950	554	485	357	665	84	26	.....
6	33	60	6,000	5,350	2,760	519	452	327	554	60	15	.....
7	26	84	2,670	21,700	1,950	554	452	270	420	50	15	.....
8	26	84	1,240	25,100	1,300	590	420	219	327	50	15	.....
9	26	115	704	17,500	1,300	554	420	172	219	50	15	.....
10	26	327	590	11,400	786	519	554	172	172	50	15	.....
11	26	298	554	6,880	1,950	485	590	132	151	41	15	.....
12	26	270	554	21,700	1,300	420	590	132	151	41	15	.....
13	26	244	485	13,700	786	665	519	132	115	33	15	.....
14	26	219	485	6,880	786	7,320	485	132	84	26	15	.....
15	20	172	452	3,700	519	3,900	388	115	71	15	15	.....
16	20	115	452	1,950	519	1,730	357	115	50	15	15	.....
17	20	115	420	1,950	485	786	298	115	50	15	15	.....
18	20	115	420	5,780	485	704	270	99	50	15	15	.....
19	20	115	420	3,700	485	665	219	99	50	15	15	.....
20	20	115	420	3,700	485	590	172	132	50	15	20	.....
21	20	99	388	5,780	485	554	151	298	41	15	84	.....
22	20	84	388	4,720	485	1,190	151	1,730	50	15	84	.....
23	20	84	388	3,700	452	1,140	151	1,480	50	15	270	.....
24	20	71	388	11,400	452	1,030	132	2,100	1,950	15	270	.....
25	20	60	357	6,880	627	1,080	151	1,190	704	15	195	.....
26	20	60	357	4,720	927	20,000	244	1,080	452	15	151	.....
27	15	50	357	3,700	1,950	23,600	627	1,030	172	60	84	.....
28	15	50	554	2,760	2,580	9,770	1,140	1,030	115	41	50	.....
29	15	50	704	2,760	.....	3,500	665	1,030	71	26	26	.....
30	15	50	704	1,950	.....	2,340	665	978	60	26	15	.....
31	15	.....	2,940	1,300	.....	1,360	.....	978	.....	15	11	.....

a Mean discharge for September estimated, 11 second-feet.

NOTE.—Daily discharge computed from a rating curve fairly well defined between 50 and 6,550 second-feet (gage heights 0.3 and 12.7 feet). Above 6,550 second-feet the rating curve is simply an extension and discharge values above that point should therefore be used with caution. See "Accuracy" in station description and footnote to table of daily gage heights.

Monthly discharge of Dix River near Burgin, Ky., for the year ending Sept. 30, 1913.

[Drainage area, 416 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	41	15	24.3	0.058	0.07
November	327	15	108	.260	.29
December	6,000	50	787	1.89	2.18
January	25,100	1,300	6,800	16.3	18.79
February	2,760	452	1,090	2.62	2.73
March	23,600	420	2,940	7.07	8.15
April	1,140	132	450	1.08	1.20
May	2,100	99	557	1.34	1.54
June	1,950	41	350	.841	.94
July	172	15	39.9	.096	.11
August	270	11	50.5	.121	.14
September	.....	.....	11	.026	.03
The year	25,100	.....	1,110	2.67	36.17

NOTE.—See "Accuracy" in station description and footnote to table of daily gage heights.

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WABASH RIVER BASIN.

WABASH RIVER AT MOUNT CARMEL, ILL.

Location.—At Southern Railway bridge at Mount Carmel, Ill., 1½ miles below mouth of White River and immediately below mouth of Patoka River.

Records available.—June 16, 1884, to November, 1904, United States Corps of Engineers; November, 1904, to September 30, 1913, United States Weather Bureau.

Drainage area.—28,600 square miles. (Revised since last report.)

Gage.—Staff gage attached to pivot pier of drawspan, read once daily to tenths.

Control.—Practically permanent.

Discharge measurements.—Made from downstream side of bridge. There are numerous overflow openings in the railroad embankment east of the railroad bridge.

Floods.—The flood of March-April, 1913, reached a height of 31.0 feet on March 30; maximum stage published by United States Weather Bureau prior to 1913, 28.3 feet August 7, 1875.

Winter flow.—The discharge relation may be affected by ice for a week or so at a time during December, January, and February.

Accuracy.—Data insufficient for estimates of discharge.

Cooperation.—Gage heights furnished by United States Weather Bureau.

No discharge measurements were made at this station during the year ending September 30, 1913.

Daily gage height, in feet, of Wabash River at Mount Carmel, Ill., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4.4	2.2	2.3	1.9	23.8	6.3	29.2	7.1	4.2	2.6	1.9	1.8
2	4.2	2.2	2.3	1.9	23.3	9.0	28.2	7.0	4.1	2.6	1.8	1.6
3	4.1	2.9	2.3	1.9	22.8	10.0	27.2	6.9	4.6	2.6	1.8	1.5
4	3.6	3.3	2.2	1.9	21.4	10.3	26.4	6.6	4.8	2.6	1.8	1.4
5	3.1	3.5	2.1	2.0	19.4	10.3	25.7	6.3	4.6	2.6	1.8	1.3
6	2.8	3.6	2.1	2.2	16.7	10.3	24.9	6.1	4.4	2.6	1.7	1.2
7	2.6	3.7	2.3	2.9	13.4	10.0	24.2	5.8	4.1	2.5	1.7	1.2
8	2.4	3.7	2.3	6.4	10.4	9.7	23.6	5.5	3.9	2.5	1.6	1.2
9	2.2	3.7	2.2	9.9	8.3	9.3	23.0	5.3	3.7	2.4	1.6	1.2
10	1.9	3.8	2.2	12.1	7.4	9.0	22.6	5.1	3.6	2.3	1.6	1.2
11	1.8	3.8	2.2	13.6	6.9	8.7	22.3	5.0	3.4	2.3	1.6	1.2
12	1.7	3.9	2.2	15.6	6.8	8.3	22.0	4.8	3.2	2.3	1.6	1.2
13	1.7	4.0	2.2	16.7	6.7	8.6	21.7	4.6	3.2	2.3	1.6	1.2
14	1.7	4.1	2.1	17.4	6.4	10.1	21.4	4.5	3.1	2.3	1.6	1.2
15	1.7	4.1	2.1	18.0	6.2	12.7	21.1	4.4	3.1	2.3	1.6	1.3
16	1.7	4.0	2.0	18.4	6.1	13.7	21.1	4.3	3.1	2.3	2.2	1.4
17	1.6	3.8	1.9	19.5	6.0	14.2	21.2	4.3	3.0	2.3	2.5	1.4
18	1.5	3.7	1.9	20.3	6.0	14.4	21.2	5.1	2.9	2.2	2.6	1.4
19	1.4	3.5	1.9	20.8	5.9	14.2	21.1	5.3	2.8	2.1	2.7	1.4
20	1.8	3.4	1.9	21.2	5.8	13.4	20.6	5.3	2.8	2.7	2.6	1.4
21	2.0	3.3	2.0	21.8	5.8	12.2	19.6	5.3	2.7	4.0	2.7	1.6
22	2.1	3.3	2.1	22.0	6.3	11.9	17.6	5.2	2.6	4.6	2.7	1.8
23	2.2	3.1	2.2	22.3	6.5	13.4	14.2	5.2	2.6	4.6	2.7	1.8
24	2.2	3.0	2.2	22.6	6.7	13.6	11.4	4.8	2.6	4.2	2.9	1.8
25	2.2	2.9	2.2	22.9	6.7	18.3	9.9	4.5	2.8	3.7	3.6	1.8
26	2.1	2.8	2.1	23.3	6.5	21.4	8.9	4.3	2.9	3.2	3.4	1.8
27	2.1	2.7	2.0	23.5	6.4	23.0	8.3	4.2	2.9	3.0	2.7	1.8
28	2.1	2.6	1.9	23.9	6.3	24.8	7.8	4.4	2.8	2.8	2.4	1.7
29	2.1	2.5	1.8	24.2	.....	27.8	7.3	4.3	2.7	2.7	2.3	1.6
30	2.1	2.4	1.8	24.3	.....	31.0	7.2	4.2	2.6	2.3	2.2	1.5
31	2.1	.....	1.8	24.2	.....	30.2	.....	4.2	.....	2.0	2.0	.....

NOTE.—Observer made no notes concerning ice. Discharge relation probably not affected by ice during the year ending Sept. 30, 1913.

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EAST BRANCH OF WHITE RIVER AT SHOALS, IND.

Location.—At highway bridge between East Shoals and West Shoals, Ind., a short distance above the Baltimore & Ohio Southwestern Railroad bridge.

Records available.—June 25, 1903, to July 21, 1906; October 12, 1908, to September 30, 1913.

Drainage area.—4,900 square miles.

Gage.—Standard chain gage attached to bridge. The gage datum was raised 61 feet on January 1, 1909, to agree with that used by the United States Weather Bureau. From January 1 to June 30, the gage was read once daily in the morning to tenths. During the remainder of the year it was read daily, morning and evening, to tenths. Limits of use: Half tenths below 4.5 and tenths above 4.5 feet.

Control.—Solid rock; permanent.

Discharge measurements.—Made from downstream side of bridge.

Floods.—The flood of March-April, 1913, reached a stage of 42.2 feet at 7 a. m. March 28. Maximum gage height as published by the United States Weather Bureau prior to 1913, 34.1 feet, March 30, 1904; flood of March, 1897, said to have been 1 to 1½ feet higher.

Winter flow.—In severe winters discharge relation affected by ice during portions of January and February; in ordinary winters there is little if any ice at the station.

Accuracy.—Station was not visited by engineers of the Geological Survey during 1912 and 1913. On December 5, 1914, the station was visited, the bench marks and elevation of the zero of the gage checked with wye level and a discharge measurement made. Because of an error in the gage, found on the above date, the daily gage height and values of daily and monthly discharge from July 1 to December 31, 1912, as published in Water Supply Paper 323 are in error. The corrected daily gage height and daily and monthly discharge are given in the following tables.

The discharge measurement (gage height 2.23 feet) made on December 5, 1914, checks the low-water portion of the rating curve, but as no discharge measurements have been made at the higher stages nothing is known as to the effect of the extreme flood of March–April, 1913, on the discharge relation at the higher stages. Consequently no estimates of discharge subsequent to March 25, 1913, have been prepared for publication.

The discharge rating table used October 1, 1912, to March 25, 1913, is based on discharge measurements made during 1909, 1910, and 1911, and the form or previous curves. The rating curve reverses at about 3,980 second-feet (gage height 4.5 feet), is drawn as a tangent above 17,000 second-feet (gage height 11 feet), and is fairly well defined throughout the range of stage over which it has been used.

Cooperation.—Gage readings are furnished by the United States Weather Bureau part of the year.

No discharge measurements have been made at this station during the year ending September 30, 1913.

43520°—WSP 353—15——6

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Daily gage height, in feet, of East Branch of White River at Shoals, Ind., from July 1, 1912, to Sept. 30, 1913.

[G. H. Rowe, observer.]

Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.
1912.				1912.				1912.			
1	3.45	2.7	4.1	11	4.9	2.9	3.1	21	4.6	4.8	2.95
2	3.65	2.9	4.0	12	4.7	2.7	2.9	22	5.3	5.6	2.75
3	3.5	2.75	3.65	13	4.6	3.25	2.75	23	4.9	6.3	3.15
4	3.8	2.7	3.5	14	4.5	3.6	2.7	24	4.9	6.1	3.05
5	4.15	2.75	3.3	15	4.5	3.8	2.6	25	4.7	5.4	3.1
6	4.1	2.6	3.15	16	4.6	5.0	2.4	26	4.45	4.8	3.65
7	4.15	2.75	3.1	17	4.7	5.8	2.75	27	4.1	4.45	4.1
8	5.0	2.75	2.85	18	4.35	5.4	2.7	28	3.6	4.2	3.95
9	5.7	2.35	3.0	19	4.4	4.7	2.9	29	3.5	4.1	3.65
10	5.2	2.8	3.0	20	4.45	4.15	2.95	30	3.25	4.6	3.4
								31	2.7	4.5	.....

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1913.												
1	3.35	2.95	2.55	2.8	9.8	6.9	33.6	4.2	3.2	3.05	2.7	2.4
2	3.3	2.75	2.6	3.1	6.9	9.0	30.3	4.1	3.2	2.95	2.6	2.35
3	3.0	2.8	3.05	3.2	6.4	9.7	27.8	4.0	3.2	2.95	2.6	2.25
4	3.0	2.85	2.6	3.5	5.9	9.2	26.6	3.9	3.1	2.7	2.45	2.65
5	2.9	2.95	2.5	3.4	5.0	8.8	25.6	4.0	3.0	2.5	2.15	2.5
6	2.85	2.95	2.55	4.1	5.2	7.7	22.3	3.8	2.8	2.85	2.05	2.65
7	2.85	3.05	2.75	5.7	5.0	6.7	19.9	3.7	2.9	2.9	2.6	2.4
8	2.9	3.1	2.65	9.8	4.7	6.0	20.7	3.6	3.0	3.0	2.65	2.55
9	2.85	3.15	2.85	11.9	4.5	5.8	19.5	3.5	2.8	2.55	2.85	2.1
10	2.7	3.0	3.15	11.6	4.1	5.5	18.8	3.5	3.0	2.55	2.65	1.85
11	2.5	2.9	3.1	13.4	4.4	6.2	17.8	3.5	3.1	2.8	2.55	2.3
12	2.5	3.15	3.05	17.8	4.2	5.1	17.2	3.5	3.1	2.4	2.35	2.5
13	2.6	2.85	2.8	18.7	4.5	5.2	17.7	3.3	3.1	2.65	2.2	2.5
14	2.55	2.8	2.5	18.7	4.1	7.1	19.1	3.3	2.7	2.3	2.2	2.6
15	2.7	3.0	2.5	18.9	4.1	9.7	19.7	3.2	2.9	2.8	2.25	2.6
16	2.5	2.8	2.65	19.7	3.9	10.0	19.4	3.2	2.6	2.7	2.2	2.4
17	2.75	2.9	2.85	21.8	4.1	10.0	18.1	3.2	3.1	2.65	2.75	2.2
18	2.6	3.0	2.45	23.4	4.0	9.4	15.2	3.3	.....	2.7	2.9	2.6
19	2.65	3.1	2.55	23.0	4.1	6.3	11.9	3.6	2.8	2.65	3.1	2.45
20	2.65	3.0	2.75	22.2	4.1	6.1	8.8	3.5	2.7	2.65	2.85	2.15
21	2.45	2.95	2.75	23.3	4.4	6.0	6.9	3.4	2.7	2.75	2.9	2.4
22	2.9	2.95	2.7	24.4	4.4	7.3	6.0	3.3	2.9	3.05	4.4	2.5
23	2.6	2.85	2.65	25.1	4.6	8.0	5.5	3.3	2.7	2.9	4.5	2.25
24	2.8	2.65	2.55	26.3	4.6	8.7	5.2	3.1	2.7	2.85	3.45	2.45
25	2.9	2.6	2.5	26.3	4.5	21.6	4.9	3.1	2.6	2.8	3.8	2.2
26	2.85	2.9	2.65	25.8	4.2	29.4	4.8	3.3	2.6	2.85	3.5	2.2
27	2.6	2.9	2.7	25.3	4.2	37.0	4.7	3.2	2.9	2.65	3.15	2.1
28	2.55	2.8	2.7	25.0	4.7	42.0	4.6	3.0	3.1	2.55	2.8	2.6
29	2.85	2.55	2.55	23.8	.....	41.5	4.6	3.2	3.0	2.35	2.7	2.4
30	2.75	2.6	2.6	21.0	.....	39.4	4.2	3.2	2.5	2.35	2.6	2.15
31	2.9	.....	2.55	15.1	.....	36.6	.....	3.2	.....	2.3	2.5	.....

NOTE.—Observer made no note concerning ice. Discharge relation probably not materially affected by ice during year ending Sept. 30, 1913.

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Daily discharge, in second-feet, of East Branch of White River at Shoals, Ind., from July 1, 1912, to Mar. 25, 1913.

Day.	July.	Aug.	Sept.	Day.	July.	Aug.	Sept.
1912.				1912.			
1	1,660	740	3,000	16	4,230	5,210	500
2	2,000	930	2,760	17	4,480	7,060	785
3	1,740	785	2,000	18	3,600	6,140	740
4	2,310	740	1,740	19	3,730	4,480	930
5	3,120	785	1,430	20	3,860	3,120	985
6	3,000	650	1,220	21	4,230	4,730	985
7	3,120	785	1,160	22	5,910	6,600	785
8	5,210	785	880	23	4,970	8,160	1,220
9	6,830	465	1,040	24	4,970	7,720	1,100
10	5,680	830	1,040	25	4,480	6,140	1,160
11	4,970	930	1,160	26	3,860	4,730	2,000
12	4,480	740	930	27	3,000	3,860	3,000
13	4,230	1,360	785	28	1,910	3,240	2,640
14	3,980	1,910	740	29	1,740	3,000	2,000
15	3,980	2,310	650	30	1,360	4,230	1,580
				31	740	3,980	.....

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
1913.						
1	1,500	985	610	830	15,000	9,460
2	1,430	785	650	1,160	9,460	13,600
3	1,040	830	1,100	1,290	8,380	14,900
4	1,040	880	650	1,740	7,280	14,000
5	930	985	570	1,580	5,210	13,200
6	880	985	610	3,000	5,680	11,100
7	880	1,100	785	6,830	5,210	9,040
8	930	1,160	695	15,000	4,480	7,500
9	880	1,220	880	18,400	3,980	7,060
10	740	1,040	1,220	17,900	3,000	6,370
11	570	930	1,160	20,600	3,730	7,940
12	570	1,220	1,100	27,200	3,240	5,450
13	650	880	830	28,600	3,980	5,680
14	610	830	570	28,600	3,000	9,880
15	740	1,040	570	28,800	3,000	14,900
16	570	830	[a] 695	30,000	2,530	15,400
17	785	930	880	33,200	3,000	15,400
18	650	1,040	535	35,600	2,760	14,300
19	695	1,160	610	35,000	3,000	8,160
20	695	1,040	785	33,800	3,000	7,720
21	535	985	785	35,400	3,730	7,500
22	930	985	740	37,100	3,730	10,300
23	650	880	695	38,200	4,230	11,700
24	830	695	610	40,000	4,230	13,000
25	930	650	570	40,000	3,980	32,900
26	880	930	695	39,200	3,240	.....
27	650	930	740	38,400	3,240	.....
28	610	830	740	38,000	4,480	.....
29	880	610	610	36,200	.....	.....
30	785	650	650	32,000	.....	.....
31	930	.....	610	23,200	.....	.....

[a] Dec. 16 observer reported: "Rise evidently due to gates in dam at Williams."

NOTE.—See "Accuracy" in station description.

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Monthly discharge of East Branch of White River at Shoals, Ind., for the years ending Sept. 30, 1912–13.

[Drainage area, 4,900 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1912.						
October	19,100	1,910	7,400	1.51	1.74	B.
November	7,940	1,660	5,660	1.16	1.29	C.
December	17,000	2,880	8,560	1.75	2.02	B.
January	.....	.....	7,780	1.59	1.83	D.
February	29,200	.....	8,050	1.64	1.77	D.
March	36,000	6,830	22,000	4.49	5.18	C.
April	32,000	7,720	17,900	3.65	4.07	B.
May	26,400	3,730	14,600	2.98	3.44	A.
June	5,210	1,580	2,220	.453	.51	B.
July	6,830	740	3,660	.747	.86	A.
August	8,160	465	3,130	.639	.74	A.
September	3,000	500	1,360	.278	.31	B.
The year	36,000	465	8,550	1.74	23.76	
1913.						
October	1,500	535	819	.167	.19	A.
November	1,220	610	934	.191	.21	A.
December	1,220	535	740	.151	.17	A.
January	40,000	830	24,700	5.04	5.81	B.
February	15,000	2,530	4,640	.947	.99	B.

NOTE.—See "Accuracy" in station description. Values for months October, 1911, to June, 1912, are republished from previous reports to complete the year ending Sept. 30, 1912.

TENNESSEE RIVER BASIN.

FRENCH BROAD RIVER AT ASHEVILLE, N. C.

Location.—At highway bridge, known as Smith's bridge, about 1 mile below the Southern Railway station at Asheville, about 2 miles below the mouth of Swannanoa River. Smith's bridge is one-fourth mile above the new Southern Railway bridge and about one-fourth mile below a concrete highway bridge recently completed.

Records available.—March 19, 1903, to September 30, 1913. The United States Weather Bureau has maintained a gage at this point since March 19, 1903, and during 1904 a number of discharge measurements were made by the United States Geological Survey. Since January 1, 1905, the discharge measurements have been continued by the United States Geological Survey and the gage heights have been furnished by the United States Weather Bureau.

Drainage area.—987 square miles.

Gages.—Vertical staff attached to one of the bridge piers and an auxiliary chain gage attached to the bridge in the first panel to the left of the staff gage. The staff gage ends at zero and the chain gage is used for readings below zero. Both gages are adjusted to the same datum, which has remained unchanged since they were established. Gage read once daily to tenths.

Control.—Practically permanent. Channel at measuring section broken by three piers of the highway bridge. Bed of river is mostly rock but is not excessively rough. Current good at all points.

Discharge measurements.—Made from the downstream side of the highway bridge.

Floods.—The flood of August 31, 1910, reached a height of about 8.8 feet by the gage datum. Stage of 10.6, "date unknown," reported by the United States Weather Bureau.

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Winter flow.—Not affected by ice.

Accuracy.—The construction of a new railroad bridge across the river about 1,500 feet below the gage in 1907–8, caused changes in channel necessitating revision of the discharge rating curve. The cofferdams caused temporary and variable changes during 1908, but since the completion of the work comparatively permanent conditions of flow have been reestablished. Data are considered reliable, though no discharge measurements were made during the year ending September 30, 1913.

Cooperation.—Gage heights are furnished by the United States Weather Bureau.

Daily gage height, in feet, of French Broad River at Asheville, N. C., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	0.0	−0.4	−0.3	0.2	1.0	2.3	2.0	0.6	0.4	0.1	−0.2	−0.3
2	.0	.1	− .3	.0	.4	1.5	1.6	.6	.4	.0	.4	− .4
3	− .1	− .1	.1	.0	.3	.9	1.6	.6	.3	− .1	.0	− .4
4	− .2	− .3	− .1	.2	1.1	.4	1.4	.5	.8	.1	− .1	− .4
5	− .3	− .4	.2	.0	1.0	.3	1.4	.5	.6	1.0	− .3	.3
6	− .2	− .3	.4	− .1	.8	.2	1.2	.5	.6	.5	.1	.2
7	− .2	.2	.7	− .1	.5	.2	1.1	.5	.4	.0	.1	− .2
8	− .3	1.4	.4	− .1	.3	− .1	1.0	.7	1.9	− .2	.3	− .3
9	− .3	.5	.2	.0	.2	− .1	1.0	.7	1.4	− .2	.4	− .3
10	− .3	.2	− .1	− .1	.1	.1	.9	.6	1.0	− .2	1.4	− .4
11	− .3	.0	− .2	− .1	.1	1.0	1.7	.4	.7	− .2	.6	− .5
12	− .4	− .1	− .2	− .1	.2	.8	3.7	.4	.4	− .1	.2	− .5
13	− .3	− .2	− .2	− .1	.3	.3	3.5	.3	.4	− .1	.5	− .5
14	.2	− .2	− .3	− .1	.1	4.3	2.7	.3	.3	− .2	.1	− .5
15	.0	− .3	− .3	− .2	.1	6.2	2.8	.4	.2	− .2	.2	− .1
16	− .2	− .3	− .3	− .2	.1	6.0	2.4	.4	.2	− .2	.4	.2
17	− .3	− .3	− .3	− .2	.0	4.6	2.0	.4	.1	− .3	.0	1.0
18	− .3	− .3	− .3	− .2	.0	3.4	1.8	.4	.0	− .4	− .1	.6
19	− .3	− .4	− .3	− .2	− .1	2.1	1.5	.2	.5	− .4	− .2	.6
20	− .3	− .4	− .3	− .2	− .1	1.8	1.4	.4	.4	− .5	− .3	.4
21	− .3	− .3	− .3	− .2	1.3	1.2	1.2	.3	.2	.0	.0	1.3
22	− .2	− .3	− .3	− .1	1.1	2.4	1.1	.2	.1	− .4	− .2	1.1
23	− .2	− .4	− .3	− .1	.8	1.8	1.0	.6	.1	− .4	− .2	.4
24	− .2	− .4	− .3	.2	.4	1.5	1.0	3.2	.3	− .1	.4	.1
25	− .2	− .4	− .3	.9	.3	1.6	.9	2.5	.2	− .2	.1	.0
26	− .3	− .4	− .2	.6	.1	2.1	.8	1.2	.2	.2	− .4	− .1
27	− .3	− .4	− .2	.5	1.0	5.2	1.1	1.0	.1	.3	− .4	− .2
28	− .3	− .4	− .2	2.6	2.3	4.6	1.0	1.2	.2	.2	− .4	− .2
29	− .4	− .4	− .3	1.7	.....	4.3	.8	.8	.1	.1	− .4	− .3
30	− .4	− .4	− .3	1.0	.....	3.3	.7	.6	.5	− .2	.7	.0
31	− .4	.....	.6	.8	.....	2.5	.....	.5	.....	.1	.0	.....

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Daily discharge, in second-feet, of French Broad River at Asheville, N. C., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,390	1,010	1,100	1,600	2,600	4,980	4,350	2,060	1,820	1,490	1,190	1,100
2	1,390	1,490	1,100	1,390	1,820	3,410	3,590	2,060	1,820	1,390	1,820	1,010
3	1,290	1,290	1,490	1,390	1,710	2,460	3,590	2,060	1,710	1,290	1,390	1,010
4	1,190	1,100	1,290	1,600	2,750	1,820	3,240	1,940	2,320	1,490	1,290	1,010
5	1,100	1,010	1,600	1,390	2,600	1,710	3,240	1,940	2,060	2,600	1,100	1,710
6	1,190	1,100	1,820	1,290	2,320	1,600	2,910	1,940	2,060	1,940	1,490	1,600
7	1,190	1,600	2,190	1,290	1,940	1,600	2,750	1,940	1,820	1,390	1,490	1,190
8	1,100	3,240	1,820	1,290	1,710	1,290	2,600	2,190	4,150	1,190	1,710	1,100
9	1,100	1,940	1,600	1,390	1,600	1,290	2,600	2,190	3,240	1,190	1,820	1,100
10	1,100	1,600	1,290	1,290	1,490	2,750	2,460	2,060	2,600	1,190	3,240	1,010
11	1,100	1,390	1,190	1,290	1,490	2,600	3,770	1,820	2,190	1,190	2,060	920
12	1,010	1,290	1,190	1,290	1,600	2,320	8,510	1,820	1,820	1,290	1,600	920
13	1,100	1,190	1,190	1,290	1,710	1,490	7,960	1,710	1,820	1,290	1,940	920
14	1,600	1,190	1,100	1,290	1,490	10,200	5,900	1,710	1,710	1,190	1,490	920
15	1,390	1,100	1,100	1,190	1,490	16,200	6,140	1,820	1,600	1,190	1,600	1,290
16	1,190	1,100	1,100	1,190	1,490	15,600	5,200	1,820	1,600	1,190	1,820	1,600
17	1,100	1,100	1,100	1,190	1,390	11,100	4,350	1,820	1,490	1,100	1,390	2,600
18	1,100	1,100	1,100	1,190	1,390	7,690	3,960	1,820	1,390	1,010	1,290	2,060
19	1,100	1,010	1,100	1,190	1,290	4,550	3,410	1,600	1,940	1,010	1,190	2,060
20	1,100	1,010	1,100	1,190	1,290	3,960	3,240	1,820	1,820	920	1,100	1,820
21	1,100	1,100	1,100	1,190	3,070	2,910	2,910	1,710	1,600	1,390	1,390	3,070
22	1,190	1,100	1,100	1,290	2,750	5,200	2,750	1,600	1,490	1,010	1,190	2,750
23	1,190	1,010	1,100	1,290	2,320	3,960	2,600	2,060	1,490	1,010	1,190	1,820
24	1,190	1,010	1,100	1,600	1,820	3,410	2,600	7,160	1,710	1,290	1,820	1,490
25	1,190	1,010	1,100	2,460	1,710	3,590	2,460	5,430	1,600	1,190	1,490	1,390
26	1,100	1,010	1,190	2,060	1,490	4,550	2,320	2,910	1,600	1,600	1,010	1,290
27	1,100	1,010	1,190	1,940	2,600	13,000	2,750	2,600	1,490	1,710	1,010	1,190
28	1,100	1,010	1,190	5,660	4,980	11,100	2,600	2,910	1,600	1,600	1,010	1,190
29	1,010	1,010	1,100	3,770	.....	10,200	2,320	2,320	1,490	1,490	1,010	1,100
30	1,010	1,010	1,100	2,600	.....	7,420	2,190	2,060	1,940	1,190	2,190	1,390
31	1,010	.....	2,060	2,320	.....	5,430	.....	1,940	.....	1,490	1,390	.....

NOTE.—Daily discharge determined by means of a discharge rating curve well defined between 920 and 10,800 second-feet (gage heights −0.5 and 4.5 feet).

Monthly discharge of French Broad River at Asheville, N. C., for the year ending Sept. 30, 1913.

[Drainage area, 987 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	1,600	1,010	1,160	1.18	1.36	B.
November	3,240	1,010	1,240	1.26	1.41	B.
December	2,190	1,100	1,290	1.31	1.51	B.
January	5,660	1,190	1,690	1.71	1.97	B.
February	4,980	1,290	2,000	2.03	2.11	A.
March	16,200	1,290	5,460	5.53	6.38	B.
April	8,510	2,190	3,640	3.69	4.12	A.
May	7,160	1,600	2,290	2.32	2.68	A.
June	4,150	1,390	1,900	1.93	2.15	A.
July	2,600	920	1,340	1.36	1.57	B.
August	3,240	1,010	1,510	1.53	1.76	B.
September	3,070	920	1,450	1.47	1.64	B.
The year	16,200	920	2,080	2.11	28.66	

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TENNESSEE RIVER AT CHATTANOOGA, TENN., FLORENCE, ALA., AND JOHNSONVILLE, TENN.

The long-time records of gage height and discharge for Tennessee River at Chattanooga, Florence, and Johnsonville, contained in the following pages, afford a basis for estimating the flow of the river at any point on the middle and lower sections of the Tennessee by means of a study of relative drainage areas.

The discharge at Florence and Johnsonville has not been computed for the earlier years of the gage-height records for reasons stated in the descriptions of those stations. For periods for which discharge estimates are not published, information concerning the gage and daily gage-height record is given in detail to enable those so desiring to make such close study of the data for the earlier years as may be needful in connection with any problem. All such estimates should be used with due caution.

The following table shows the mean annual discharge at the three stations, derived from records extending back to 1875 at Chattanooga and to 1895 at Florence and Johnsonville. To make the results entirely comparable, the Chattanooga record has also been computed for the 19-year period 1895–1913.

Mean annual discharge and drainage areas for Tennessee River at Chattanooga, Florence, Johnsonville, and its mouth.

Station.	Distance from mouth (miles).[a]	Drainage area.		Period.		Mean annual discharge.	
		Square miles.	Per cent of drainage area at mouth.	Years ending Sept. 30.	Length (years).	Second-feet.	Per cent of estimated discharge at mouth.
Chattanooga	464	21,400	53	1875–1913	39	39,500	63
Do	464	21,400	53	1895–1913	19	37,500	60
Florence	256	30,800	76	1895–1913	19	51,600	82
Johnsonville	96	38,500	95	1895–1913	19	[b] 60,900	97
Mouth	0	40,700	100	1895–1913	19	[c] 63,000	100

[a] From results of survey by the United States Engineer Corps.
[b] Mean at Johnsonville, 1890–1913 (24 years), 62,700 second-feet.
[c] Estimated from Johnsonville discharge and fact that run-off per square mile decreases toward mouth of river.

The ratios of monthly and yearly mean discharge, given in the following table, together with the drainage area ratios afford a convenient means of comparing the published records of discharge for the three stations. Under normal conditions the ratios of discharge should always be less than unity, because in computing the ratios, the values for the station with the smaller drainage area are placed in the numerator. In general the discharge ratio is expected to be greater than

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the drainage area ratio because the run-off per square mile usually decreases from the source toward the mouth of a stream.

All the ratios of mean annual discharge for the 19-year period 1895–1913, shown by the table, are greater than the corresponding drainage area ratios, indicating that the general law holds true for Tennessee River. A very close agreement among discharge ratios for stations so widely separated as Chattanooga, Florence, and Johnsonville can not be expected because of the variable factors involved, such, for example, as the intensity and distribution of precipitation. Some seeming inconsistencies in the ratios are explained by a rise at the end of the month, which affects the upper station more than the lower station before the end of that month, as, for example, October and November, 1878. Ratios for two stations may be expected, however, to follow some general law, and in this way the ratios afford a rough check on the applicability of the rating curves for the periods over which they are used, and also a means of discovering gross errors in the data.

Ratios of discharge of Tennessee River at Chattanooga, Tenn., Florence, Ala., and Johnsonville, Tenn., for the years ending Sept. 30, 1890–1913.

[Drainage area ratios: $\frac{\text{Chattanooga}}{\text{Florence}} = .70$, $\frac{\text{Chattanooga}}{\text{Johnsonville}} = .56$, $\frac{\text{Florence}}{\text{Johnsonville}} = .80$.][a]

Month.	$\frac{\text{Chattanooga}}{\text{Florence}}$	$\frac{\text{Chattanooga}}{\text{Johnsonville}}$	$\frac{\text{Florence}}{\text{Johnsonville}}$
1890.			
October		0.67	
November		.64	
December		.62	
January		b.52	
February		b.54	
March		b.51	
April		b.54	
May		.66	
June		.64	
July		.89	
August		.81	
September		.69	
The year		.58	
1891.			
October		.89	
November		.68	
December		.96	
January		.56	
February		.57	
March		b.54	
April		b.53	
May		.69	
June		.84	
July		.81	
August		.79	
September		.78	
The year		.62	

[a] The ratios of the average mean annual discharge for the 19 years 1895–1913 given in the table on page 87 are: $\frac{\text{Chattanooga}}{\text{Florence}} = .73$, $\frac{\text{Chattanooga}}{\text{Johnsonville}} = .62$, $\frac{\text{Florence}}{\text{Johnsonville}} = .85$.

[b] Discharge at Johnsonville estimated. See "Backwater" in station description.

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Ratios of discharge of Tennessee River at Chattanooga, Tenn., Florence, Ala., and Johnsonville, Tenn., for the years ending Sept. 30, 1890–1913—Continued.

Month.	Chattanooga / Florence	Chattanooga / Johnsonville	Florence / Johnsonville
1892.			
October		0.75	
November		.83	
December		.66	
January		.66	
February		.50	
March		.58	
April		a.44	
May		a.53	
June		.73	
July		.54	
August		.68	
September		.56	
The year		.56	
1893.			
October		.60	
November		.85	
December		.39	
January		.53	
February		.66	
March		.46	
April		.34	
May		.56	
June		.41	
July		.83	
August		.88	
September		.96	
The year		.54	
1894.			
October		1.00	
November		.86	
December		.76	
January		.57	
February		.45	
March		.50	
April		.47	
May		.84	
June		.80	
July		.88	
August		.85	
September		.71	
The year		.60	
1895.			
October	0.77	.80	1.03
November	.74	.79	1.07
December	.97	1.06	1.09
January	.71	.65	.92
February	.67	.61	.90
March	.68	.57	.83
April	.76	.66	.88
May	.82	.82	1.00
June	.82	.74	.90
July	.82	.79	.97
August	.85	.81	.96
September	.75	.73	.98
The year	.75	.69	.92
1896.			
October	.67	.75	1.12
November	.79	.84	1.07
December	.70	.70	1.00
January	.73	.69	.94
February	.55	.42	.76
March	.62	.46	.75
April	.72	.60	.83
May	.72	.60	.83
June	.90	.83	.92
July	1.00	.98	.98
August	.91	.79	.86
September	.82	.85	1.03
The year	.73	.62	.85

a Discharge at Johnsonville estimated. See "Backwater" in station description.

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Ratios of discharge of Tennessee River at Chattanooga, Tenn., Florence, Ala., and Johnsonville, Tenn., for the years ending Sept. 30, 1890–1915—Continued.

Month.	Chattanooga / Florence	Chattanooga / Johnsonville	Florence / Johnsonville
1897.			
October	0.82	0.85	1.04
November	.87	.92	1.05
December	.80	.67	.84
January	.73	.63	.86
February	.95	.92	.97
March	.57	.50	.88
April	.68	a.47	a.68
May	.80	.70	.88
June	1.01	.99	.98
July	.97	.99	1.02
August	.89	.81	.91
September	.78	.75	.97
The year	.73	.63	.87
1898.			
October	.77	.86	1.11
November	.70	.73	1.05
December	.67	.58	.87
January	.65	a.52	a.80
February	.67	a.47	a.70
March	.75	a.61	a.82
April	.69	a.55	a.79
May	.82	.72	.88
June	.88	.84	.96
July	1.04	1.04	1.00
August	.92	.87	.95
September	1.01	1.06	1.05
The year	.78	.67	.86
1899.			
October	.99	1.03	1.04
November	.93	.94	1.02
December	.85	.82	.96
January	.67	.50	.75
February	.69	.62	.90
March	.67	.62	.93
April	.70	a.50	a.71
May	.88	.79	.90
June	.94	.96	1.02
July	.90	.93	1.03
August	.76	.75	.99
September	.84	.91	1.09
The year	.74	.66	.88
1900.			
October	.74	.83	1.13
November	.75	.85	1.14
December	.59	.56	.95
January	.63	.56	.89
February	.73	.63	.86
March	.72	.63	.87
April	.45	.37	.81
May	.71	.57	.80
June	.55	.39	.70
July	.68	.41	.61
August	.75	.68	.90
September	.89	.85	.96
The year	.64	.52	.82
1901.			
October	.75	.71	.94
November	.98	.76	.78
December	.72	.62	.86
January	.66	.56	.85
February	.63	.51	.80
March	.72	.73	1.00
April	.72	.65	.91
May	.88	.85	.96
June	.86	.74	.86
July	.90	.86	.95
August	.81	.78	.97
September	.76	.67	.88
The year	.77	.69	.90

a Discharge at Johnsonville estimated. See "Backwater" in station description.

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Ratios of discharge of Tennessee River at Chattanooga, Tenn., Florence, Ala., and Johnsonville, Tenn., for the years ending Sept. 30, 1890–1913—Continued.

Month.	Chattanooga / Florence	Chattanooga / Johnsonville	Florence / Johnsonville
1902.			
October	0.84	0.83	0.99
November	.89	.90	1.02
December	.89	.93	1.05
January	.65	.57	.88
February	.65	.52	.80
March	.70	.61	.88
April	.63	.42	.67
May	.88	.79	.91
June	.99	.96	.97
July	.97	.97	1.00
August	.85	.84	.99
September	.94	.98	1.05
The year	.74	.64	.87
1903.			
October	.87	.81	.93
November	.96	.95	.99
December	.65	a.45	a.69
January	.68	.53	.78
February	.60	.50	.83
March	.71	a.61	a.86
April	.77	.65	.85
May	.75	.63	.85
June	.75	.60	.81
July	.84	.80	.95
August	.86	.83	.96
September	.81	.75	.93
The year	.71	.60	.84
1904.			
October	.77	.74	.96
November	.85	.81	.95
December	.81	.72	.90
January	.77	.68	.89
February	.93	.92	.99
March	.69	.64	.93
April	.62	a.43	a.68
May	.88	.84	.95
June	.80	.72	.90
July	.88	.82	.94
August	.87	.89	1.02
September	b.80	.78	b.97
The year	.77	.69	.89
1905.			
October	b.72	.69	b.97
November	b.83	.85	b1.03
December	.84	.79	.94
January	.69	.55	.80
February	.62	.57	.93
March	.65	.48	.73
April	.84	.82	.97
May	.74	.60	.81
June	.76	.68	.89
July	.76	.70	.92
August	.94	.95	1.02
September	.75	.67	.90
The year	.73	.63	.87
1906.			
October	.77	.72	.94
November	.75	.65	.86
December	.72	.63	.88
January	.67	.58	.87
February	.78	.64	.82
March	.63	.54	.86
April	.74	a.56	a.75
May	.87	.79	.90
June	.94	.95	1.01
July	.81	.73	.90
August	.93	.87	.93
September	.84	.84	1.01
The year	.77	.68	.88

a Discharge at Johnsonville estimated. See "Backwater" in station description.
b Discharge at Florence estimated. See "Daily discharge" in station description.

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Ratios of discharge of Tennessee River at Chattanooga, Tenn., Florence, Ala., and Johnsonville, Tenn., for the years ending Sept. 30, 1890–1913—Continued.

Month.	Chattanooga / Florence	Chattanooga / Johnsonville	Johnsonville / Florence
1907.			
October	0.68	0.57	0.84
November	.85	.61	.71
December	.82	.61	.74
January	.69	a.55	a.80
February	.66	a.52	a.79
March	.67	a.51	a.77
April	.89	.81	.91
May	.60	.37	.62
June	.95	.85	.90
July	.91	.78	.86
August	.97	.89	.91
September	.91	.91	1.00
The year	.76	.60	.79
1908.			
October	.86	.68	.79
November	.94	.99	1.05
December	.79	.69	.87
January	.77	.64	.83
February	.65	a.52	a.80
March	.70	a.57	a.82
April	.79	a.62	a.79
May	.81	a.60	a.74
June	.96	.74	.77
July	.94	.80	.85
August	1.08	1.00	.93
September	.83	.65	.78
The year	.79	.65	.82
1909.			
October	.98	.94	.96
November	1.03	.86	.84
December	.83	.81	.97
January	.76	.67	.87
February	.65	.59	.90
March	.65	.47	.72
April	.67	.52	.78
May	.75	.64	.86
June	.69	.60	.88
July	.80	.68	.85
August	.91	.84	.92
September	.92	.85	.92
The year	.74	.62	.84
1910.			
October	.82	.71	.86
November	.81	.68	.84
December	.78	.70	.89
January	.69	.53	.77
February	.66	.50	.76
March	.71	.55	.77
April	.78	.52	.67
May	.76	.71	.93
June	.72	.62	.86
July	.65	.52	.81
August	.87	.78	.89
September	.90	.84	.94
The year	.74	.60	.82
1911.			
October	.78	.68	.88
November	.75	.67	.90
December	.71	.68	.95
January	.64	.57	.90
February	.66	.53	.80
March	.77	.70	.91
April	.54	.43	.79
May	.80	.66	.82
June	.84	.70	.84
July	.73	.62	.85
August	.71	.55	.77
September	.98	.79	.80
The year	.67	.56	.83

a Discharge at Johnsonville estimated. See "Backwater" in station description.

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Ratios of discharge of Tennessee River at Chattanooga, Tenn., Florence, Ala., and Johnsonville, Tenn., for the years ending Sept. 30, 1890–1913—Continued.

Month.	Chattanooga Florence	Chattanooga Johnsonville	Florence Johnsonville
1912.			
October	1.02	0.94	0.93
November	.95	.85	.89
December	.51	.36	.72
January	.53	.34	.64
February	.64	.52	.82
March	.60	a.51	a.85
April	.60	a.48	a.81
May	.63	a.49	a.78
June	.77	.67	.88
July	.73	.60	.83
August	.77	.70	.91
September	.79	.75	.95
The year	.64	.51	.80
1913.			
October	.80	.66	.82
November	.87	.75	.86
December	.73	.60	.82
January	.61	a.47	a.77
February	.52	a.39	a.75
March	.67	a.55	a.83
April	.60	a.41	a.68
May	.85	.86	1.02
June	.78	.66	.85
July	.81	.70	.86
August	.80	.71	.89
September	.78	.71	.91
The year	.67	.53	.80

a Discharge at Johnsonville estimated. See "Backwater" in station description.

It will be observed that the Florence-Johnsonville ratios are greater than unity for a number of the low-water months during the earlier years of the records. This indicates that the Johnsonville rating table as applied to the observed gage heights yields discharge values that are too low at low stages prior to about 1900. There are no data upon which to base a change in either the rating table or the observed gage heights, and no change has been made, even though the comparisons with other stations indicate that the low-water record at Johnsonville may be in error. Where the ratios of the monthly means differ widely from the ratios of the average mean annual discharge the data should be used with due caution.

TENNESSEE RIVER AT CHATTANOOGA, TENN.

Location.—At Hamilton County highway bridge in the city of Chattanooga, just below Chattanooga Island, 4 miles below South Chickamauga Creek, 3 miles above Chattanooga Creek, 188 miles below the junction of French Broad and Holston Rivers, and 464 miles above the mouth of the Tennessee.

Records available.—April 1, 1874, to October 21, 1913. The records of stage kept by the United States Weather Bureau subsequent to October 21, 1913, can not be utilized for computing discharge because of the operation of the power plant at Hales Bar, 33 miles below Chattanooga. All available data are published in this report. Some of the data have previously appeared in the following reports of the Geological Survey: Part IV of the Eighteenth to Twenty-second Annual Reports, and Water-Supply Papers 11, 15, 27, 36, 39, 48, 52, 65, 75, 83, 98, 128, 169, 205, 243, 263, 283, 303, and 323.

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Drainage area.—21,400 square miles (measured from topographic sheets).

Gage.—Standard gage consists of a sloping iron section (railroad T rail) bolted to rock and a vertical timber attached to the rock cliff on the left bank at the foot of Lookout Street, about 200 feet upstream from the bridge. It was erected October 31, 1884, and is owned by the United States Weather Bureau. An automatic recording gage, which makes its record in the Weather Bureau office at Chattanooga, was installed December 30, 1902 (see "Accuracy"). There is also a vertical section of brass gage attached to the pier nearest the left bank, and recently half-foot graduations have been painted on the pipe incasing the recording gage float, to be read from the bridge with the aid of a glass. The original gage was established in 1874. The datum is believed to have remained the same for all the gages. The sea-level elevation of the zero of the gage, as published by the Weather Bureau, is 617.8 feet, and is said to correspond to the low-water mark of September, 1839.

Descriptions of the gages maintained at this station are contained in "Daily river stages," published by the Weather Bureau, and "Stages of the Mississippi River and of its principal tributaries," published by the Mississippi River Commission.

Bench marks.—Following description taken from "Stages of the Mississippi River and of its principal tributaries," for 1913:

Bench mark now in use is the top of water table on southeast corner of United States post-office building on Eleventh Street, between Market and A Streets. Elevation above zero of gage, 74.37 feet.

Another bench mark is described as follows, in "Daily river stages, Part X," published in 1911:

U. S. B. M. 81, bolt on downstream side of second pier from left bank of Chattanooga highway bridge, is 6.7 feet above zero of the gage and 624.5 feet above mean sea level.

Daily gage height.—Taken from published reports of Mississippi River Commission and the original records and published reports of the United States Weather Bureau and published to tenths of a foot. The values are believed to represent one reading a day at about 7 a. m., central time, except from May 24, 1897, to July 10, 1900, during which time the values represent the mean of two readings a day, one in the morning and the other in the afternoon. See "Accuracy" for note relative to recording gage observations.

Control.—Probably permanent or nearly so during period covered by records available. Hales Bar dam, 33 miles below Chattanooga, now constitutes the control.

Discharge measurements.—Made from downstream footway of bridge; elevation about 100 feet above the water at ordinary stage. The results of the five discharge measurements, made during 1891–92, in the table on page 96, were taken from page 174 of "Discharge observations, Mississippi River and its tributaries and outlets, 1895–1897," published by the Mississippi River Commission, and reduced to three significant figures. Additional results are given by the United States Engineer Corps in a table of "discharge measurements," published on plate 182, House Document 360, Sixty-second Congress, second session, but it is believed that the heading of the table is misleading and that the results given in the table on pages 96–97 of this report are the only ones that are from field determinations of discharge.

Daily discharge.—Computed for entire period covered by daily gage-height records from discharge rating tables on pages 97–100, upon which the periods of applicability are noted. Some of the values in the following tables differ from those published in previous reports. The changes are the result of differences of interpretation, based upon more complete data than were available when the estimates of discharge for the respective years were first prepared. The same discharge rating

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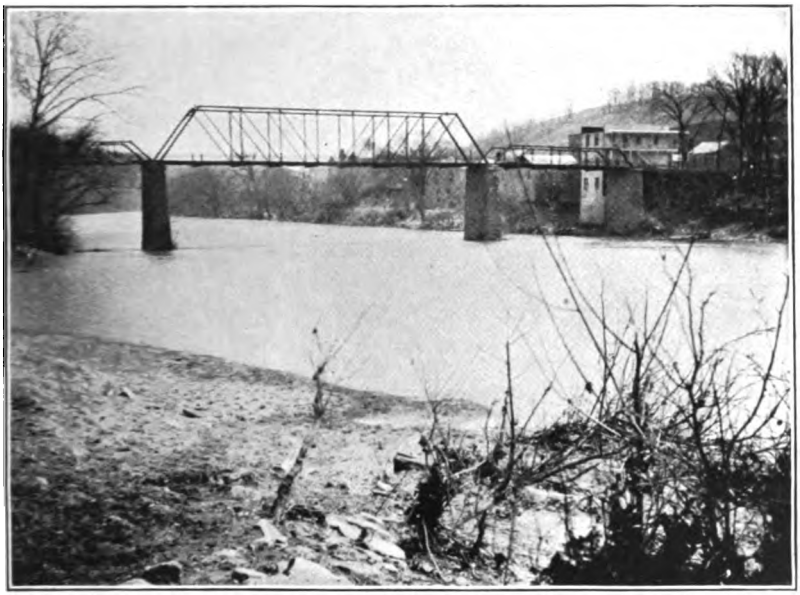
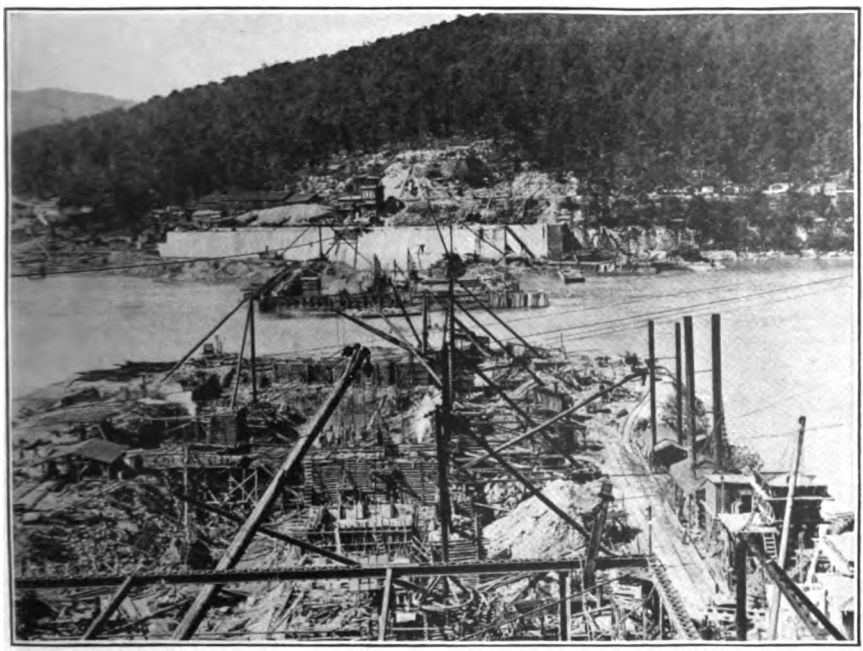


A. GAGING STATION ON ELK RIVER AT CLENDENIN, W. VA., MARCH 31, 1913.

View looking upstream from right bank just below mouth of Big Sandy Creek. Gage height, 6.0 feet; discharge, about 3,400 second-feet.



B. HALES BAR DAM, TENNESSEE RIVER BELOW CHATTANOOGA, TENN., OCTOBER 19, 1910.

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table was used in this report from April 1, 1874, to March 15, 1909, because it is believed that, on the whole, the best results are thus obtained, although some measurements, such as those made during the calendar years 1899–1902, plot consistently about 5 to 10 per cent off the curve from which the table was prepared. The changes in the discharge relation subsequent to March 15, 1909, are believed to be due to operations in the river channel below Chattanooga. The discharge measurement made April 19, 1909, indicates a change in the discharge relation since October 17, 1906, the date of the last previous discharge measurement. March 16, 1909, was selected as the date of change.

For January 15–22, 1893, gage observer reported "frozen" and daily discharge was interpolated.

Duration of flow.—The table on pages 149–150 gives the number of days in each year that the daily discharge as given in the tables on pages 120–140 was less than certain limiting values which are given in the first column of the duration table. The theoretical horsepower corresponding to each limiting discharge is also given. By subtraction the table gives the number of days each year that the daily discharge was between the respective limits. For example, during the year ending September 30, 1904, the daily discharge was less than 12,000 second-feet and equal to or greater than 11,000 second-feet for 16 days. The table also gives, by subtraction, the number of days each year that the daily discharge was equal to or greater than the respective limiting values of discharge, and by reference to the discharge rating table the discharge for any year may be expressed in terms of gage height. During the year ending September 30, 1904, for example, the daily discharge was equal to or greater than 20,000 second-feet for 149 days, or the stage of the river was greater than 3.5 feet for that number of days.

Floods.—The flood of March 11, 1867, reached a stage of about 58.6 feet referred to gage datum, according to "Daily river stages for 1911 and 1912," published by the Weather Bureau.

Point of zero flow.—Reports of the United States engineers show that the bottom of the excavated boat channel at Ross Towhead, 2½ miles below the gage, is about 5 feet lower than gage datum, indicating that there would be no flow past the gage if the stage were to fall to about −5.0 feet.

Winter flow.—Discharge relation not appreciably affected by ice.

Regulation.—There is believed to have been no artificial regulation of the flow of the Tennessee at Chattanooga prior to October 22, 1913, at which time backwater is said to have reached the gage from the dam constructed by the Chattanooga & Tennessee River Power Co. on Tennessee River, at Hales Bar, 33 miles below Chattanooga. Beginning October 22, 1913, the flow at Chattanooga has been regulated by the operation of this great dam, and no estimates of discharge have been prepared. (See Pl. V, *B*.)

Ratios.—The table on pages 88–93 gives the ratios of monthly and yearly mean discharge of Tennessee River at Chattanooga, Florence, and Johnsonville. A discussion of the ratios accompanies the table.

Accuracy.—The ratings in the accuracy column in the tables of monthly discharge for the years ending September 30, 1895–1913, especially for the earlier years, must not be considered to indicate as closely the probable reliability of the data as the accuracy ratings outlined on page 15 for the average gaging station. A low accuracy rating in the following tables does not signify that the mean discharge is known to be in error by the amount indicated, but rather that it appears from studies of the data and comparisons with other stations that the mean discharge is doubtful to that extent. The accuracy ratings will assist those using the data in determining by brief inspection whether certain portions of the record are considered sufficiently accurate for the purpose in hand or whether they require special investigation to more closely determine their probable

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reliability. The accuracy ratings given in the tables of monthly discharge for the years ending September 30, 1895–1913, are based principally on the plotting of the discharge measurements made during the different years with respect to the rating curve used for the time in question. Some weight was given to the comparison with the discharge at Florence and with the discharge at Knoxville from 1902 to 1909. No accuracy ratings are given prior to the year ending September 30, 1895, because there is nothing definite on which to base them. The number of discharge measurements prior to 1895 is not sufficient to warrant the use of the measurements for the purpose of determining to which station, if either, apparent discrepancies indicated by the ratios of discharge at Chattanooga and Florence are due. Those using these records can best determine whether or not they are sufficiently accurate for the purpose in hand by a detailed study of the data.

The following statement appears under "Accuracy," in Water-Supply Paper 303, which contains data for 1911 for the Ohio River basin:

> Daily gage heights * * * are as furnished by the United States Weather Bureau and were obtained from the automatic recording gage record with corrections based on periodic readings of the gage painted on the float pipe. The reading of the automatic recording gage has been checked at various times by engineers of the Survey and found to be essentially correct, but on November 25, 1911, a discrepancy of 0.5 foot was noted, the automatic recording gage reading too high by that amount. The discharge measurements made by Survey engineers are referred to the cliff or float pipe gages, to which, therefore, the discharge rating curve refers. The accuracy of daily and monthly discharge obtained by applying this rating curve to the automatic recording gage record is questionable and these discharge values should be used with caution. It should be noted, however, that the discrepancy in the published daily discharge for November 24 and 25 (1911) as obtained from the Weather Bureau gage heights and the measured discharge on those days is due in part to the difference in the time of the gage readings.

The results published in this report are believed to be as accurate as the available base data will yield and are believed to be free from gross errors.

Cooperation.—Daily gage-height records furnished by the United States Engineer Corps and the United States Weather Bureau. Results of discharge measurements made during 1893 were furnished by the Weather Bureau, and use was made of the results obtained by the Engineer Corps noted under "Discharge measurements."

Discharge measurements of Tennessee River at Chattanooga, Tenn., during 1891–1913.

No.	Date.	Hydrographer.	Gage height.	Discharge.
	1891.		*Feet.*	*Sec.-ft.*
A	Nov. 5	D. L. Sublett[a]	1.2	8,200
	Nov. 6			
B	13	.....do.....	3.0	17,600
	1892.			
C	Jan. 15	D. L. Sublett[a]	35.0	240,000
	Jan. 16			
D	Apr. 11	.....do.....	30.0	195,000
E	Dec. 12	Capt. John Biddle[b]	2.3	13,700
	1893.			
1	Mar. 15	L. M. Pindell[c]	10.3	63,000
2	16	.....do.....	9.2	58,300
3	Apr. 3	.....do.....	5.1	32,600
4	4	.....do.....	5.1	32,600
5	May 5	.....do.....	26.0	156,000
6	8	.....do.....	26.0	152,000
7	9	.....do.....	16.0	97,000
8	17	.....do.....	9.9	65,900
9	18	.....do.....	10.4	67,900
	1897.		*Feet.*	*Sec.-ft.*
10	May 8	M. R. Hall.....	7.07	44,200
11	28	.....do.....	4.52	25,900
12	June 29	.....do.....	5.76	32,900
13	July 13	.....do.....	4.59	26,900
14	Sept. 7	.....do.....	1.67	10,300
15	Oct. 6	.....do.....	.48	5,970
16	Nov. 16	A. P. Davis.....	.83	5,550
17	Dec. 23	M. R. Hall.....	10.30	67,000
	1898.			
18	May 10	M. R. Hall.....	4.14	22,100
19	July 29	.....do.....	5.30	29,700
20	Aug. 19	.....do.....	6.37	36,700
21	Oct. 6	.....do.....	17.60	120,000
22	28	J. C. Conn.....	6.00	36,000
23	Nov. 29	.....do.....	4.75	29,600
24	29	.....do.....	4.70	31,300
	1899.			
25	May 3	M. R. Hall.....	6.71	37,900
26	26	.....do.....	4.76	25,500

[a] Assistant engineer, U. S. Engineer Corps.
[b] United States Engineer Corps.
[c] Observer in charge, U. S. Weather Bureau, Chattanooga, Tenn.

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Discharge measurements of Tennessee River at Chattanooga, Tenn., during 1891–1915—Continued.

No.	Date.	Hydrographer.	Gage height.	Discharge.
	1899.		*Feet.*	*Sec.-ft.*
27	June 21	W. E. Hall	4.15	21,400
28	Sept. 15	M. R. Hall	1.90	10,800
29	Oct. 27	.....do	.80	6,570
	1900.			
30	Mar. 13	M. R. Hall	11.25	66,000
31	July 27	J. C. Conn	3.45	18,500
	1901.			
32	Jan. 24	M. R. Hall	5.60	30,300
33	Apr. 4	K. T. Thomas	24.20	155,000
34	July 31	.....do	2.80	15,400
35	Aug. 18	.....do	31.70	199,000
	1902.			
36	June 25	W. E. Hall	3.80	17,800
37	Oct. 9	J. C. Conn	2.00	10,700
38	Nov. 14	O. P. Hall	1.55	9,280
	1903.			
39	Mar. 26	O. P. Hall	28.85	190,000
40	July 21	M. R. Hall	3.85	20,900
41	Sept. 5	J. M. Giles	1.60	10,500
42	Oct. 21	M. R. Hall	1.10	8,060
	1904.			
43	Feb. 3	J. M. Giles	2.77	16,500
44	10	.....do	5.85	35,600
45	Apr. 19	.....do	4.30	25,000
46	July 6	.....do	3.18	17,600
47	Aug. 5	B. S. Drane	2.73	14,700
48	Oct. 13	.....do	.21	5,370
49	14	.....do	.22	5,560
50	22	.....do	.03	4,860
	1905.			
51	May 9	W. E. Hall	6.65	40,000
52	June 13	B. S. Drane	2.92	16,200
53	29	.....do	6.28	35,700
54	July 22	Hall and Hoyt	5.32	29,200
55	Oct. 11	F. A. Murray	1.65	10,300
56	Dec. 28	.....do	7.44	43,400
	1906.			
57	May 9	F. A. Murray	8.36	52,800
58	23	O. P. Hall	3.40	19,800
59	June 21	.....do	5.45	31,300
60	Oct. 17	F. A. Murray	5.59	31,900
	1909.			
61	Apr. 19	Hall and Hoyt	6.52	36,600
	1910.			
62	May 27	M. R. Hall	12.42	76,000
63	Sept. 24	.....do	2.40	13,000
	1911.			
64	Nov. 24	R. E. Robertson	[a] 4.20	23,100
65	25	.....do	[b] 3.90	20,800
	1912.			
66	Mar. 31	W. E. Hall	31.3	[c]185,000
	1913.			
67	Oct. 21	W. E. Hall and B. M. Hall, Jr.	1.10	7,410

[a] Gage height obtained by reducing readings on Weather Bureau recording gage by 0.5 foot.
[b] Gage height as read on Weather Bureau gage on float pipe and found to be 0.5 foot less than recorded by Weather Bureau recording gage.
[c] Float measurement.

NOTE.—Measurement *A* was made at Tumbling Shoals about 10 miles below Chattanooga.
Measurement *E* was made at Soddy Shoals about 23 miles above Chattanooga.
Measurements *A*, *B*, *C*, and *D* were made with a current meter submerged at 4 or 5 points in each vertical. There is no record of the method used in taking observations for measurement *E*. See report of Chief of Engineers, U. S. Army, 1896, Part 3, page 2014.
Measurements 1 to 9 were made with a large Haskell current meter, submerged at one-half depth. See "Discharge measurements" in station description.

Discharge rating table for Tennessee River at Chattanooga, Tenn., from Apr. 1, 1874, to Mar. 15, 1909.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.00	4,800	1.80	11,010	3.60	20,100	5.40	30,820
.10	5,060	1.90	11,450	3.70	20,660	5.50	31,470
.20	5,330	2.00	11,900	3.80	21,220	5.60	32,120
.30	5,610	2.10	12,360	3.90	21,790	5.70	32,780
.40	5,900	2.20	12,830	4.00	22,360	5.80	33,450
.50	6,200	2.30	13,310	4.10	22,940	5.90	34,120
.60	6,510	2.40	13,800	4.20	23,520	6.00	34,800
.70	6,830	2.50	14,300	4.30	24,100	6.10	35,480
.80	7,160	2.60	14,800	4.40	24,690	6.20	36,160
.90	7,500	2.70	15,310	4.50	25,280	6.30	36,840
1.00	7,850	2.80	15,820	4.60	25,870	6.40	37,520
1.10	8,210	2.90	16,340	4.70	26,470	6.50	38,200
1.20	8,580	3.00	16,860	4.80	27,070	6.60	38,880
1.30	8,960	3.10	17,390	4.90	27,680	6.70	39,560
1.40	9,350	3.20	17,920	5.00	28,300	6.80	40,240
1.50	9,750	3.30	18,460	5.10	28,920	6.90	40,920
1.60	10,160	3.40	19,000	5.20	29,550	7.00	41,600
1.70	10,580	3.50	19,550	5.30	30,180	7.10	42,280

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Discharge rating table for Tennessee River, at Chattanooga, Tenn., from Apr. 1, 1874, to Mar. 15, 1909—Continued.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
7.20	42,960	13.30	84,440	19.40	125,920	25.50	167,400
7.30	43,640	13.40	85,120	19.50	126,600	25.60	168,080
7.40	44,320	13.50	85,800	19.60	127,280	25.70	168,760
7.50	45,000	13.60	86,480	19.70	127,960	25.80	169,440
7.60	45,680	13.70	87,160	19.80	128,640	25.90	170,120
7.70	46,360	13.80	87,840	19.90	129,320	26.00	170,800
7.80	47,040	13.90	88,520	20.00	130,000	26.10	171,480
7.90	47,720	14.00	89,200	20.10	130,680	26.20	172,160
8.00	48,400	14.10	89,880	20.20	131,360	26.30	172,840
8.10	49,080	14.20	90,560	20.30	132,040	26.40	173,520
8.20	49,760	14.30	91,240	20.40	132,720	26.50	174,200
8.30	50,440	14.40	91,920	20.50	133,400	26.60	174,880
8.40	51,120	14.50	92,600	20.60	134,080	26.70	175,560
8.50	51,800	14.60	93,280	20.70	134,760	26.80	176,240
8.60	52,480	14.70	93,960	20.80	135,440	26.90	176,920
8.70	53,160	14.80	94,640	20.90	136,120	27.00	177,600
8.80	53,840	14.90	95,320	21.00	136,800	27.10	178,280
8.90	54,520	15.00	96,000	21.10	137,480	27.20	178,960
9.00	55,200	15.10	96,680	21.20	138,160	27.30	179,640
9.10	55,880	15.20	97,360	21.30	138,840	27.40	180,320
9.20	56,560	15.30	98,040	21.40	139,520	27.50	181,000
9.30	57,240	15.40	98,720	21.50	140,200	27.60	181,680
9.40	57,920	15.50	99,400	21.60	140,880	27.70	182,360
9.50	58,600	15.60	100,080	21.70	141,560	27.80	183,040
9.60	59,280	15.70	100,760	21.80	142,240	27.90	183,720
9.70	59,960	15.80	101,440	21.90	142,920	28.00	184,400
9.80	60,640	15.90	102,120	22.00	143,600	29.00	191,200
9.90	61,320	16.00	102,800	22.10	144,280	30.00	198,000
10.00	62,000	16.10	103,480	22.20	144,960	31.00	204,800
10.10	62,680	16.20	104,160	22.30	145,640	32.00	211,600
10.20	63,360	16.30	104,840	22.40	146,320	33.00	218,400
10.30	64,040	16.40	105,520	22.50	147,000	34.00	225,200
10.40	64,720	16.50	106,200	22.60	147,680	35.00	232,000
10.50	65,400	16.60	106,880	22.70	148,360	36.00	238,800
10.60	66,080	16.70	107,560	22.80	149,040	37.00	245,600
10.70	66,760	16.80	108,240	22.90	149,720	38.00	252,400
10.80	67,440	16.90	108,920	23.00	150,400	39.00	259,200
10.90	68,120	17.00	109,600	23.10	151,080	40.00	266,000
11.00	68,800	17.10	110,280	23.20	151,760	41.00	272,800
11.10	69,480	17.20	110,960	23.30	152,440	42.00	279,600
11.20	70,160	17.30	111,640	23.40	153,120	43.00	286,400
11.30	70,840	17.40	112,320	23.50	153,800	44.00	293,200
11.40	71,520	17.50	113,000	23.60	154,480	45.00	300,000
11.50	72,200	17.60	113,680	23.70	155,160	46.00	306,800
11.60	72,880	17.70	114,360	23.80	155,840	47.00	313,600
11.70	73,560	17.80	115,040	23.90	156,520	48.00	320,400
11.80	74,240	17.90	115,720	24.00	157,200	49.00	327,200
11.90	74,920	18.00	116,400	24.10	157,880	50.00	334,000
12.00	75,600	18.10	117,080	24.20	158,560	51.00	340,800
12.10	76,280	18.20	117,760	24.30	159,240	52.00	347,600
12.20	76,960	18.30	118,440	24.40	159,920	53.00	354,400
12.30	77,640	18.40	119,120	24.50	160,600	54.00	361,200
12.40	78,320	18.50	119,800	24.60	161,280	55.00	368,000
12.50	79,000	18.60	120,480	24.70	161,960	56.00	374,800
12.60	79,680	18.70	121,160	24.80	162,640	57.00	381,600
12.70	80,360	18.80	121,840	24.90	163,320	58.00	388,400
12.80	81,040	18.90	122,520	25.00	164,000	59.00	395,200
12.90	81,720	19.00	123,200	25.10	164,680	60.00	402,000
13.00	82,400	19.10	123,880	25.20	165,360		
13.10	83,080	19.20	124,560	25.30	166,040		
13.20	83,760	19.30	125,240	25.40	166,720		

NOTE.—Table is not applicable for periods during which ice was present or channel was otherwise obstructed. It is based on 65 discharge measurements made during 1891–1906 listed in the table on pages 96–97. The table is well defined between discharge 4,800 and 232,000 second-feet (gage heights 0.0 and 35.0 feet). Use this table to three significant figures only.

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Discharge rating table for Tennessee River at Chattanooga, Tenn., from Mar. 16, 1909 to Dec. 31, 1911.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.20	8,050	4.90	26,610	8.60	50,260	12.30	75,040
1.30	8,380	5.00	27,200	8.70	50,920	12.40	75,720
1.40	8,730	5.10	27,800	8.80	51,580	12.50	76,400
1.50	9,100	5.20	28,400	8.90	52,240	12.60	77,080
1.60	9,490	5.30	29,000	9.00	52,900	12.70	77,760
1.70	9,900	5.40	29,610	9.10	53,570	12.80	78,440
1.80	10,320	5.50	30,220	9.20	54,240	12.90	79,120
1.90	10,750	5.60	30,830	9.30	54,910	13.00	79,800
2.00	11,200	5.70	31,440	9.40	55,580	13.10	80,480
2.10	11,660	5.80	32,060	9.50	56,250	13.20	81,160
2.20	12,130	5.90	32,680	9.60	56,920	13.30	81,840
2.30	12,600	6.00	33,300	9.70	57,590	13.40	82,520
2.40	13,070	6.10	33,930	9.80	58,260	13.50	83,200
2.50	13,550	6.20	34,560	9.90	58,930	13.60	83,880
2.60	14,030	6.30	35,190	10.00	59,600	13.70	84,560
2.70	14,520	6.40	35,830	10.10	60,270	13.80	85,240
2.80	15,010	6.50	36,470	10.20	60,940	13.90	85,920
2.90	15,500	6.60	37,110	10.30	61,610	14.00	86,600
3.00	16,000	6.70	37,750	10.40	62,280	15.00	93,400
3.10	16,510	6.80	38,400	10.50	62,950	16.00	100,200
3.20	17,030	6.90	39,050	10.60	63,620	17.00	107,000
3.30	17,560	7.00	39,700	10.70	64,290	18.00	113,800
3.40	18,100	7.10	40,360	10.80	64,960	19.00	120,600
3.50	18,640	7.20	41,020	10.90	65,630	20.00	127,400
3.60	19,180	7.30	41,680	11.00	66,300	21.00	134,200
3.70	19,730	7.40	42,340	11.10	66,970	22.00	141,000
3.80	20,280	7.50	43,000	11.20	67,640	23.00	147,800
3.90	20,840	7.60	43,660	11.30	68,310	24.00	154,600
4.00	21,400	7.70	44,320	11.40	69,980	25.00	161,400
4.10	21,960	7.80	44,980	11.50	69,650	26.00	168,200
4.20	22,530	7.90	45,640	11.60	70,320	27.00	175,000
4.30	23,100	8.00	46,300	11.70	70,990	28.00	181,800
4.40	23,680	8.10	46,960	11.80	71,660	29.00	188,600
4.50	24,260	8.20	47,620	11.90	72,330	30.00	195,400
4.60	24,840	8.30	48,280	12.00	73,000	31.00	202,200
4.70	25,430	8.40	48,940	12.10	73,680	32.00	209,000
4.80	26,020	8.50	49,600	12.20	74,360		

NOTE.—Table is not applicable for periods during which ice was present or channel was obstructed. It is based on five discharge measurements made during 1909–1911, and the form of the curve from which this table applicable Apr. 1, 1874, to Mar. 15, 1909, was computed. It is well defined between discharges of 1,200 and 79,800 second-feet (gage heights 2.0 and 13.0 feet). Use this table to three significant figures only.

Discharge rating table for Tennessee River at Chattanooga, Tenn., from Jan. 1, 1912, to Mar. 29, 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
1.20	8,050	3.40	18,100	5.60	30,830	7.80	44,460
1.30	8,380	3.50	18,640	5.70	31,440	7.90	45,080
1.40	8,730	3.60	19,180	5.80	32,060	8.00	45,700
1.50	9,100	3.70	19,730	5.90	32,680	8.10	46,320
1.60	9,490	3.80	20,280	6.00	33,300	8.20	46,940
1.70	9,900	3.90	20,840	6.10	33,920	8.30	47,560
1.80	10,320	4.00	21,400	6.20	34,540	8.40	48,180
1.90	10,750	4.10	21,960	6.30	35,160	8.50	48,800
2.00	11,200	4.20	22,530	6.40	35,780	8.60	49,420
2.10	11,660	4.30	23,100	6.50	36,400	8.70	50,040
2.20	12,120	4.40	23,680	6.60	37,020	8.80	50,660
2.30	12,600	4.50	24,260	6.70	37,640	8.90	51,280
2.40	13,070	4.60	24,840	6.80	38,260	9.00	51,900
2.50	13,550	4.70	25,430	6.90	38,880	9.10	52,520
2.60	14,030	4.80	26,020	7.00	39,500	9.20	53,140
2.70	14,520	4.90	26,610	7.10	40,120	9.30	53,760
2.80	15,010	5.00	27,200	7.20	40,740	9.40	54,380
2.90	15,500	5.10	27,800	7.30	41,360	9.50	55,000
3.00	16,000	5.20	28,400	7.40	41,980	9.60	55,620
3.10	16,510	5.30	29,000	7.50	42,600	9.70	56,240
3.20	17,030	5.40	29,610	7.60	43,220	9.80	56,860
3.30	17,560	5.50	30,220	7.70	43,840	9.90	57,480

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[illegible] for Tennessee River, at Chattanooga, Tenn., from Apr. 1, 1874, [illegible] Mar. 15, 1909—Continued.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.	Feet.	Sec.-ft.
[illegible]	[illegible]	[illegible]	[illegible]	19.40	125,920	25.50	167,400
[illegible]	[illegible]	[illegible]	[illegible]	19.50	126,600	25.60	168,080
[illegible]	[illegible]	[illegible]	[illegible]	19.60	127,280	25.70	168,760
[illegible]	[illegible]	[illegible]	[illegible]	19.70	127,960	25.80	169,440
[illegible]	[illegible]	[illegible]	[illegible]	19.80	128,640	25.90	170,120
[illegible]	[illegible]	[illegible]	[illegible]	19.90	129,320	26.00	170,800
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	130,000	26.10	171,480
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	130,680	26.20	172,160
[illegible]	[illegible]	[illegible]	[illegible]	20.20	131,360	26.30	172,840
[illegible]	[illegible]	[illegible]	[illegible]	20.30	132,040	26.40	173,520
[illegible]	[illegible]	[illegible]	[illegible]	20.40	132,720	26.50	174,200
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	133,400	26.60	174,880
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	134,080	26.70	175,560
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	134,760	26.80	176,240
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	135,440	26.90	176,920
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	136,120	27.00	177,600
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	136,800	27.10	178,280
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	137,480	27.20	178,960
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	138,160	27.30	179,640
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	138,840	27.40	180,320
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	139,520	27.50	181,000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	140,200	27.60	181,680
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	140,880	27.70	182,360
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	141,560	27.80	183,040
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	142,240	27.90	183,720
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	142,920	28.00	184,400
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	143,600	29.00	191,200
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	144,280	30.00	198,000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	144,960	31.00	204,800
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	145,640	32.00	211,600
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	146,320	33.00	218,400
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	147,000	34.00	225,200
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	147,680	35.00	232,000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	148,360	36.00	238,800
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	149,040	37.00	245,600
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	149,720	38.00	252,400
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	150,400	39.00	259,200
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	151,080	40.00	266,000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	151,760	41.00	272,800
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	152,440	42.00	279,600
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	153,120	43.00	286,400
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	153,800	44.00	293,200
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	154,480	45.00	300,000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	155,160	46.00	306,800
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	155,840	47.00	313,600
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	156,520	48.00	320,400
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	157,200	49.00	327,200
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	157,880	50.00	334,000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	158,560	51.00	340,800
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	159,240	52.00	347,600
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	159,920	53.00	354,400
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	160,600	54.00	361,200
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	161,280	55.00	368,000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	161,960	56.00	374,800
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	162,640	57.00	381,600
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	163,320	58.00	388,400
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	164,000	59.00	395,200
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	164,680	60.00	402,000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	165,360		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	166,040		
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	166,720		

NOTE.—[illegible] for periods during which ice was present or channel was [illegible] made during 1891–1906 listed in the tabl[illegible] [illegible] and 232,000 second-feet (gage heights [illegible] significant figures only.

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Discharge rating table for Tennessee River at Chattanooga, Tenn., from Jan. 1, 1912, to Mar. 29, 1913—Continued.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
10.00	58,100	12.50	73,600	15.00	89,100	17.50	104,600
10.10	58,720	12.60	74,220	15.10	89,720	17.60	105,220
10.20	59,340	12.70	74,840	15.20	90,340	17.70	105,840
10.30	59,960	12.80	75,460	15.30	90,960	17.80	106,460
10.40	60,580	12.90	76,080	15.40	91,580	17.90	107,080
10.50	61,200	13.00	76,700	15.50	92,200	18.00	107,700
10.60	61,820	13.10	77,320	15.60	92,820	19.00	113,900
10.70	62,440	13.20	77,940	15.70	93,440	20.00	120,100
10.80	63,060	13.30	78,560	15.80	94,060	21.00	126,300
10.90	63,680	13.40	79,180	15.90	94,680	22.00	132,500
11.00	64,300	13.50	79,800	16.00	95,300	23.00	138,700
11.10	64,920	13.60	80,420	16.10	95,920	24.00	144,900
11.20	65,540	13.70	81,040	16.20	96,540	25.00	151,100
11.30	66,160	13.80	81,660	16.30	97,160	26.00	157,300
11.40	66,780	13.90	82,280	16.40	97,780	27.00	163,500
11.50	67,400	14.00	82,900	16.50	98,400	28.00	169,700
11.60	68,020	14.10	83,520	16.60	99,020	29.00	175,900
11.70	68,640	14.20	84,140	16.70	99,640	30.00	182,100
11.80	69,260	14.30	84,760	16.80	100,260	31.00	188,300
11.90	69,880	14.40	85,380	16.90	100,880	32.00	194,500
12.00	70,500	14.50	86,000	17.00	101,500	33.00	200,700
12.10	71,120	14.60	86,620	17.10	102,120	34.00	206,900
12.20	71,740	14.70	87,240	17.20	102,740	35.00	213,100
12.30	72,360	14.80	87,860	17.30	103,360	36.00	219,300
12.40	72,980	14.90	88,480	17.40	103,980	37.00	225,500

NOTE.—Table is not applicable for periods during which ice was present or the channel was otherwise obstructed. It is based on one discharge measurement made during 1912 and the form of the curves from which the rating tables for previous years were computed. Below discharge 33,300 second-feet (gage height 6.0 feet) the table is the same as the one used from Mar. 16, 1909, to Dec. 31, 1911 which see for additional notes.

Discharge rating table for Tennessee River at Chattanooga, Tenn., from Mar. 30 to Oct. 21, 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
0.70	6,060	1.30	8,190	1.90	10,710	2.50	13,500
.80	6,380	1.40	8,590	2.00	11,150	2.60	13,990
.90	6,720	1.50	9,000	2.10	11,600	2.70	14,490
1.00	7,070	1.60	9,420	2.20	12,060	2.80	14,990
1.10	7,430	1.70	9,840	2.30	12,530	2.90	15,490
1.20	7,800	1.80	10,270	2.40	13,010	3.00	16,000

NOTE.—Table is not applicable for periods during which ice was present or channel was obstructed. Below discharge 16,000 second-feet (gage height 3.0 feet) it is based on one discharge measurement made during 913. Above that point the table is the same as the table used from Jan. 1, 1912, to Mar. 29, 1913, which see.
1

Daily gage height, in feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May.	June.	July.	Aug.	Sept.
1874.							1874.						
1	6.5	29.6	3.8	2.9	7.5	14.0	16	22.5	7.1	4.2	3.2	1.7	1.6
2	6.5	28.8	3.7	3.0	6.2	9.0	17	24.2	6.0	3.9	2.2	1.5	1.6
3	6.4	26.5	3.7	2.9	5.2	6.0	18	22.7	5.7	3.9	3.1	1.4	2.1
4	6.0	25.7	4.1	2.6	4.2	5.0	19	22.0	5.9	3.8	2.9	1.2	2.1
5	5.4	25.5	4.2	2.5	3.0	3.6	20	20.3	5.7	3.6	2.8	1.2	2.1
6	5.2	24.7	4.1	2.4	3.2	3.2	21	19.1	5.6	3.5	2.4	1.0	2.1
7	5.6	23.6	4.1	2.0	3.4	3.2	22	19.1	5.2	3.6	2.1	1.0	2.1
8	7.5	21.5	4.1	1.7	4.2	3.2	23	19.2	5.2	2.6	1.7	1.1	2.0
9	13.0	19.0	4.0	1.5	4.5	3.6	24	23.1	4.8	2.4	1.7	2.2	2.1
10	16.0	15.5	3.9	1.6	3.5	2.9	25	22.1	4.1	2.2	1.9	2.0	2.1
11	17.0	9.2	3.9	1.8	3.2	2.0	26	24.5	4.8	2.0	2.9	2.2	2.1
12	16.5	9.7	4.0	2.2	2.7	1.8	27	26.2	4.7	1.9	3.5	2.2	2.1
13	15.1	9.7	4.6	2.2	2.2	1.7	28	25.9	4.5	2.2	4.6	4.7	2.0
14	15.2	8.7	4.6	2.5	2.2	1.8	29	27.0	4.2	2.9	6.4	9.0	2.1
15	16.0	7.2	5.7	2.8	1.8	1.8	30	28.8	4.2	3.0	7.2	14.2	3.1
							31	.....	4.2	.....	8.5	14.5	.....

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Daily gage height, in feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1875.[a]												
1	3.4	1.4	9.2	6.4	30.5	54.0	12.7	20.7	3.4	5.2	5.5	3.7
2	4.5	1.2	8.6	7.0	25.5	51.0	14.8	19.0	3.2	5.6	5.4	3.2
3	4.9	1.2	8.0	12.5	17.0	46.0	19.4	12.7	3.2	5.3	5.3	3.2
4	4.8	1.2	6.6	13.5	11.5	43.0	20.5	10.5	3.5	5.2	5.3	3.2
5	4.0	1.0	5.0	14.6	10.4	41.7	19.0	9.4	4.1	5.1	5.9	3.1
6	2.0	.8	5.0	13.0	9.5	40.2	17.0	8.6	4.8	5.0	7.5	3.0
7	2.0	.7	4.5	11.5	8.4	37.0	14.0	7.7	4.7	5.2	6.2	2.9
8	2.1	.7	4.1	13.2	8.2	32.0	11.8	7.2	4.4	5.4	5.4	2.8
9	2.0	1.0	3.7	9.8	7.1	26.5	10.4	6.7	4.8	5.9	5.0	2.6
10	2.0	1.5	3.0	9.5	6.6	22.2	9.4	6.4	4.9	5.8	4.5	2.6
11	2.0	2.8	2.9	8.9	6.4	19.8	10.0	6.2	4.5	5.6	4.4	2.6
12	1.8	4.0	2.8	6.8	6.9	16.8	12.2	6.2	4.0	6.2	4.5	2.8
13	1.7	3.9	3.7	6.2	7.4	14.2	13.2	6.0	3.7	7.5	5.0	2.7
14	1.7	3.6	3.7	6.0	7.8	12.8	12.2	5.6	3.2	9.2	5.4	2.5
15	1.7	3.4	3.8	5.8	8.8	12.5	10.5	5.4	3.1	11.6	5.9	2.6
16	1.4	3.1	8.2	5.0	9.2	21.0	9.5	5.1	3.0	20.0	7.9	2.6
17	1.2	2.9	8.2	4.9	8.4	26.8	8.7	4.8	3.8	18.4	10.8	2.6
18	1.1	2.5	8.0	4.8	7.7	28.1	8.0	4.6	3.9	13.7	12.2	2.7
19	1.6	2.0	7.9	4.7	7.2	26.0	7.5	4.5	4.7	10.6	11.2	6.4
20	2.8	2.4	6.5	4.5	7.0	22.2	7.1	4.2	4.6	8.4	10.4	11.2
21	3.0	2.6	6.2	4.3	7.6	29.2	6.9	4.3	4.7	7.7	9.0	10.0
22	2.6	2.4	6.0	4.2	8.5	32.7	7.1	4.2	4.6	6.7	7.1	7.2
23	2.2	9.0	6.4	4.1	8.5	34.0	7.8	4.1	5.2	7.2	6.1	5.8
24	2.2	9.6	7.6	5.0	18.0	33.7	8.5	4.0	5.6	9.8	5.5	5.1
25	2.2	10.7	6.9	7.9	35.5	28.0	9.8	4.0	5.6	13.0	5.2	4.5
26	2.0	10.8	6.2	9.2	44.9	18.5	8.5	3.9	5.3	12.0	5.2	4.1
27	1.9	7.2	5.2	8.4	49.5	14.5	7.7	3.9	5.0	10.7	5.2	3.7
28	1.5	7.2	4.9	7.9	53.4	12.2	9.0	4.0	4.7	9.8	5.0	3.5
29	1.5	6.2	5.7	16.5	.....	14.5	15.0	4.0	4.6	7.9	4.7	3.4
30	1.5	9.6	6.0	28.5	.....	15.6	19.5	3.8	4.7	6.8	4.2	3.5
31	2.0	.....	6.3	32.5	.....	14.5	.....	3.5	.....	5.9	4.0	.....
1876.												
1	3.5	2.3	6.2	31.1	13.7	7.0	12.2	7.6	8.1	6.8	4.4	2.5
2	3.2	2.4	5.8	23.4	13.8	6.7	13.2	9.0	7.8	6.2	4.6	2.4
3	3.2	2.4	5.7	15.6	13.8	6.4	13.5	12.2	7.7	6.4	5.2	3.0
4	3.2	2.4	5.8	12.8	12.8	6.2	12.1	13.2	8.0	6.7	4.8	2.9
5	3.0	2.4	6.5	11.1	12.5	6.0	10.8	12.1	8.2	7.0	4.6	2.5
6	3.0	2.8	7.6	10.0	11.9	5.8	9.6	10.2	8.4	7.1	6.0	2.2
7	4.1	3.2	8.9	9.0	10.2	5.6	8.8	10.0	8.4	7.7	5.7	2.1
8	5.6	4.0	8.8	8.1	10.0	5.9	8.2	11.2	7.7	7.2	5.2	2.1
9	5.2	4.7	9.1	7.5	10.2	6.9	7.7	16.4	6.9	7.0	4.9	2.0
10	4.4	5.2	9.0	7.0	10.4	8.0	7.2	20.0	6.1	6.6	4.6	2.0
11	4.0	5.6	8.7	6.8	10.2	7.8	7.0	20.0	5.6	6.3	4.4	2.2
12	3.6	6.4	8.2	6.7	10.4	7.6	6.7	18.2	5.2	6.0	4.5	2.4
13	3.4	6.7	7.6	6.2	11.2	7.1	6.4	15.2	5.0	5.6	4.2	2.5
14	3.1	6.6	7.0	6.0	12.8	7.0	6.8	12.2	4.9	5.2	4.0	2.4
15	3.0	6.4	6.4	5.7	16.8	7.3	10.2	10.4	4.8	4.8	3.7	2.2
16	2.8	6.4	5.9	5.4	20.9	11.0	13.4	9.5	5.4	4.8	3.6	2.2
17	2.8	6.8	5.5	5.2	21.9	19.8	12.1	8.8	10.8	4.8	3.7	2.2
18	2.8	6.5	5.2	5.9	18.8	21.1	11.8	8.1	18.2	4.9	3.8	2.0
19	2.8	5.8	4.8	8.4	16.0	17.8	10.2	7.7	22.0	4.8	3.6	2.0
20	2.7	5.5	4.5	12.7	12.2	14.2	9.2	7.7	23.4	5.1	3.5	1.9
21	2.6	5.2	4.2	14.5	10.4	12.2	8.7	8.0	19.2	4.9	3.4	2.0
22	2.5	6.2	4.2	14.5	9.8	11.1	8.3	7.7	11.8	5.0	3.2	2.6
23	2.5	5.6	4.0	13.1	9.8	10.1	7.2	7.7	11.0	5.2	3.0	2.5
24	2.4	6.0	4.2	11.9	9.3	9.8	6.9	7.2	9.2	4.7	2.9	2.4
25	2.2	6.6	4.9	12.5	8.7	12.8	6.7	6.7	8.1	4.2	2.8	2.4
26	2.2	7.2	7.9	15.7	8.5	16.9	6.5	7.0	8.0	4.0	2.9	2.8
27	2.2	6.8	13.0	14.4	8.0	17.2	6.2	7.2	8.5	3.8	2.9	3.4
28	2.2	6.8	19.2	12.0	7.7	15.9	6.0	8.0	8.1	3.8	2.8	3.1
29	2.2	6.8	27.4	10.6	7.2	15.7	6.2	10.8	7.9	3.6	2.8	2.6
30	2.2	6.6	33.0	12.0	.....	15.7	6.7	9.8	7.2	3.4	2.6	2.4
31	2.2	.....	34.2	14.6	.....	13.5	.....	8.8	.....	3.8	2.5	.....

[a] This and all similar headings in this paper indicate the year ending Sept. 30 (climatic year), which includes three months of the preceding calendar year.

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Daily gage height, in feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1877.												
1	2.2	1.6	2.4	3.2	6.2	3.1	10.5	11.4	3.4	4.0	2.4	1.
2	2.1	1.5	2.4	2.6	5.8	3.2	8.2	9.8	3.2	3.7	2.2	1.
3	1.9	1.4	2.4	1.8	5.6	4.4	10.2	8.7	3.2	3.4	2.2	1.
4	1.8	1.4	2.7	1.7	5.5	6.8	10.6	7.9	3.1	3.1	2.2	1.
5	1.8	1.5	2.5	2.4	5.7	5.7	9.8	7.4	3.0	2.6	2.1	1.
6	1.8	1.5	2.0	2.2	5.8	5.5	9.2	7.3	2.9	2.5	2.0	1.
7	1.7	1.5	1.8	2.7	5.6	5.4	9.5	7.6	2.8	2.4	1.8	2.
8	1.6	1.5	1.8	4.6	5.2	5.2	13.9	7.6	3.0	2.4	1.8	2.
9	1.5	1.4	1.8	5.9	5.1	7.0	22.9	7.9	3.1	2.8	1.7	2.
10	1.5	1.4	1.7	5.7	4.9	12.0	27.9	8.2	3.2	2.8	1.7	2.
11	1.4	1.4	1.6	5.2	4.6	15.6	28.7	8.1	3.2	2.4	1.7	2.
12	1.2	1.4	1.5	5.5	4.5	14.8	26.0	8.0	3.5	2.2	1.7	3.
13	1.2	1.4	1.4	5.8	4.2	13.0	20.5	7.5	3.6	2.2	1.6	3.
14	1.1	1.2	1.6	10.0	4.2	11.5	17.9	6.9	3.5	2.0	1.6	2.
15	1.1	1.2	1.8	13.6	4.0	11.6	17.4	6.4	3.5	2.0	1.6	2.
16	1.1	1.2	1.9	18.0	3.8	9.9	16.8	6.0	3.4	1.9	1.9	2.
17	1.1	1.4	2.2	21.4	3.8	9.1	15.0	5.8	3.4	2.6	2.2	1.
18	1.0	1.4	2.2	22.7	3.6	8.8	13.0	5.8	3.4	2.1	2.0	1.
19	1.0	1.5	2.1	23.6	3.4	8.6	11.9	5.4	3.4	2.1	1.7	1.
20	1.0	1.7	2.0	22.1	3.4	8.2	12.2	4.9	3.5	3.1	1.5	2.
21	1.1	1.9	2.0	23.2	3.2	7.7	14.0	4.8	3.6	3.6	1.4	2.
22	1.1	2.2	1.8	26.4	3.2	7.1	15.2	4.8	4.1	3.7	1.3	2.
23	1.5	2.2	1.8	27.0	3.2	7.1	15.7	4.8	5.1	3.6	1.3	3.
24	2.0	2.5	2.2	24.0	3.2	6.9	14.0	4.4	4.9	4.1	1.4	2.
25	3.4	3.4	2.4	18.6	3.4	6.7	11.6	4.2	4.1	5.2	1.5	2.
26	3.2	3.9	2.8	13.0	3.4	7.8	9.8	4.0	3.7	4.7	2.5	2.
27	2.6	3.5	3.0	10.9	3.2	10.0	9.4	3.8	3.4	4.7	2.4	2.
28	2.4	3.1	3.0	9.5	3.1	13.8	12.5	3.8	3.2	4.2	2.4	2.
29	2.3	2.7	3.2	8.2	.....	16.7	14.4	3.6	3.5	3.6	2.1	2.
30	1.8	2.5	3.0	7.5	.....	15.5	12.5	3.6	4.0	3.2	1.9	1.
31	1.7	.....	3.4	6.8	.....	12.2	.....	3.5	.....	2.7	1.7	.....
1878.												
1	1.6	2.2	7.2	8.7	11.6	8.5	4.9	6.8	4.1	2.2	2.8	4.0
2	1.5	2.7	6.4	10.1	11.5	7.5	4.7	6.2	3.6	2.2	3.6	3.7
3	1.4	6.1	5.6	9.1	10.2	7.2	4.5	6.6	3.4	2.5	3.2	3.5
4	1.2	7.5	5.2	7.8	8.9	7.2	4.2	6.0	3.2	2.7	3.1	3.5
5	1.2	6.2	5.2	7.2	8.0	8.1	4.4	5.7	3.1	2.5	2.8	3.2
6	1.5	5.6	6.2	6.5	7.2	7.9	4.7	6.5	3.0	2.2	2.5	2.6
7	2.2	5.2	7.4	5.9	6.8	7.7	4.9	6.9	3.1	2.1	2.0	2.1
8	4.0	5.0	7.2	5.4	7.1	7.2	5.0	7.2	3.0	2.0	1.8	1.9
9	3.2	4.5	6.6	4.9	8.1	6.9	5.0	7.4	2.9	2.1	1.6	1.6
10	3.4	4.2	6.2	5.2	11.6	6.6	5.2	6.9	3.2	2.2	1.4	1.4
11	3.2	4.9	5.6	6.7	13.2	6.4	6.8	6.4	3.4	2.4	1.2	1.2
12	2.9	5.5	5.2	9.0	12.5	6.4	8.0	5.9	3.2	2.4	1.2	1.1
13	2.8	5.2	4.9	11.2	11.0	7.4	8.0	5.5	3.2	2.2	1.4	1.0
14	2.5	4.5	4.6	12.5	9.4	8.9	7.1	5.1	3.2	2.1	1.6	.9
15	2.2	4.1	4.2	11.4	8.2	10.1	6.5	4.9	3.2	2.1	2.1	.9
16	2.0	3.8	4.2	10.0	7.8	10.6	6.1	4.8	3.2	2.1	2.9	10.6
17	1.9	3.7	3.9	8.9	7.5	9.1	5.8	4.7	2.9	2.2	4.0	8.2
18	1.6	3.8	3.8	8.2	7.1	8.2	5.6	4.7	2.8	2.0	3.7	5.6
19	1.6	3.5	3.6	7.5	6.8	7.2	5.3	5.2	2.7	2.1	3.0	4.0
20	1.7	3.4	3.5	7.0	6.6	6.6	6.1	5.9	2.6	1.9	2.7	3.1
21	2.3	3.4	3.4	6.6	6.9	6.2	6.2	7.0	2.8	1.8	2.4	2.7
22	2.7	5.2	3.2	6.4	9.0	5.8	6.1	7.0	2.7	1.6	2.0	2.2
23	3.2	6.8	3.2	6.6	11.6	5.5	5.8	5.8	2.7	1.6	2.9	2.0
24	3.2	7.9	3.4	6.7	17.5	5.2	6.6	5.1	3.2	1.5	4.2	1.9
25	3.2	9.8	4.4	6.6	19.2	5.0	9.5	4.7	3.0	1.2	3.8	2.0
26	2.8	14.1	7.0	6.5	15.8	4.9	9.2	4.2	2.7	1.2	2.9	2.1
27	2.6	15.0	7.8	6.5	12.4	4.6	8.5	4.1	2.6	1.2	2.2	1.9
28	2.3	13.4	7.5	6.4	10.7	4.6	8.4	4.0	2.4	1.1	2.4	1.9
29	2.3	10.6	7.2	6.9	.....	4.9	8.2	4.1	2.4	1.2	2.8	1.8
30	2.3	8.6	7.8	7.2	.....	5.2	7.6	4.5	2.2	1.4	3.2	1.7
31	2.3	.....	8.5	9.7	.....	5.2	.....	4.6	.....	2.5	4.1	.....

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Daily gage height, in feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1879.												
1	1.5	3.2	14.5	5.7	11.7	11.0	5.8	4.3	3.3	1.1	2.2	2.4
2	1.2	3.5	13.2	6.3	11.6	10.6	7.4	4.3	3.3	1.2	3.9	2.2
3	1.2	3.4	12.2	7.6	10.0	9.5	8.4	4.2	3.0	1.2	4.1	2.1
4	1.1	3.5	11.7	7.5	8.6	8.5	8.5	4.1	2.8	1.2	4.3	2.2
5	1.0	3.2	11.0	6.2	8.3	7.7	7.2	3.9	2.7	1.2	4.0	2.2
6	1.0	2.9	9.7	5.6	9.3	7.1	6.5	3.8	2.6	1.2	3.3	2.6
7	1.1	2.6	8.0	4.2	11.1	6.7	6.2	5.2	2.4	1.1	3.2	2.8
8	1.1	2.4	6.8	4.3	11.1	6.3	5.8	6.4	2.3	1.0	2.9	2.5
9	1.2	2.2	6.2	8.1	10.0	6.0	5.7	5.8	2.2	.9	2.9	2.1
10	1.5	2.2	7.5	20.3	10.0	5.9	6.2	4.8	2.0	.9	2.8	1.9
11	1.6	2.0	9.2	23.9	9.0	5.6	8.0	4.3	2.1	1.0	2.9	1.5
12	1.6	1.9	10.9	27.5	8.3	5.5	8.8	3.9	2.2	1.0	2.6	1.4
13	1.6	1.8	9.9	32.8	8.1	5.0	8.2	3.6	2.4	1.0	2.5	1.3
14	1.7	1.8	10.5	37.7	7.8	5.2	7.4	3.5	2.7	1.0	2.2	1.2
15	1.9	1.9	10.0	38.0	7.3	5.2	6.8	3.9	2.8	.9	1.9	1.2
16	1.9	2.0	11.0	37.6	6.8	5.0	6.7	3.9	2.7	.9	1.8	1.0
17	1.9	2.0	11.7	27.8	7.6	4.9	7.9	4.0	2.9	1.1	2.1	1.0
18	1.8	2.0	10.8	17.1	14.6	4.9	8.3	5.2	2.5	1.0	2.0	1.0
19	1.6	2.0	9.9	14.0	18.8	4.8	8.2	5.8	2.2	1.0	1.7	.9
20	1.6	2.2	8.6	14.5	17.1	4.7	8.0	6.0	2.0	1.0	1.7	.9
21	1.6	2.2	7.5	14.0	13.9	4.5	8.0	5.9	1.6	1.3	1.2	.8
22	1.6	2.4	7.6	12.8	11.5	4.7	7.4	5.8	1.5	1.2	1.3	.8
23	1.7	2.2	8.2	10.9	10.5	6.6	7.0	5.7	1.4	1.0	1.8	.7
24	1.8	2.5	8.7	9.3	10.6	6.8	6.5	4.7	1.3	.9	2.6	.6
25	2.1	2.7	9.0	8.6	12.1	6.8	6.0	4.5	1.3	1.0	2.8	.5
26	5.6	3.2	8.2	7.9	12.4	6.9	5.2	4.2	1.3	.8	3.3	.5
27	7.0	8.0	7.2	7.4	12.0	6.8	4.9	3.6	1.2	.9	4.0	.4
28	5.4	16.0	6.2	7.0	11.5	6.6	4.7	3.3	1.1	1.2	4.1	.4
29	4.4	18.0	5.5	6.9	.....	6.4	4.6	3.1	1.0	1.7	3.9	.4
30	3.7	16.0	5.1	7.6	.....	6.2	4.4	3.0	1.0	1.9	3.4	.4
31	3.2	.....	5.4	8.2	.....	5.8	.....	3.1	.....	1.8	2.8	.....
1880.												
1	.3	2.4	5.5	7.9	4.2	9.0	7.9	14.5	5.5	3.2	1.8	2.4
2	.3	2.3	4.8	7.2	4.3	8.1	7.6	14.5	5.7	3.0	1.7	2.2
3	.3	2.2	4.5	6.6	5.0	7.6	9.0	13.0	6.0	3.4	1.8	2.1
4	.3	2.0	4.0	6.0	6.2	9.3	14.5	11.7	6.2	5.3	1.9	2.4
5	.2	1.9	3.7	5.6	6.7	13.7	16.9	9.9	5.5	7.8	2.6	2.9
6	.2	1.8	3.7	5.4	6.2	17.0	15.5	8.7	5.2	6.8	2.8	3.1
7	.2	1.7	4.8	6.5	5.8	15.8	13.0	8.0	4.8	5.8	2.6	3.1
8	.2	1.6	4.8	7.8	5.4	15.6	12.3	7.5	4.4	5.6	4.3	2.9
9	.2	1.6	4.7	9.5	5.0	19.0	10.9	6.8	4.2	4.7	4.2	2.8
10	.2	1.5	4.4	10.6	4.6	24.5	9.6	6.4	4.0	4.2	4.2	2.4
11	1.3	1.6	6.9	10.0	4.4	28.0	8.6	6.0	3.7	3.9	4.6	2.8
12	1.6	2.0	14.6	9.6	4.4	28.4	8.8	5.9	3.5	3.6	3.9	3.2
13	2.2	2.1	15.0	8.9	5.4	28.7	7.8	5.8	3.5	3.3	3.7	3.7
14	1.9	2.1	12.2	8.0	12.4	28.6	7.0	5.6	3.4	3.2	3.8	3.8
15	1.7	2.1	13.8	7.6	22.9	28.6	6.5	5.4	3.2	3.0	4.3	3.5
16	1.3	2.0	17.9	7.0	26.8	31.9	8.1	5.2	3.0	2.9	3.6	3.2
17	1.3	2.1	17.8	6.5	26.8	35.0	11.1	4.8	2.9	4.4	3.7	2.9
18	1.7	2.8	15.6	6.2	19.8	38.3	12.2	4.6	2.8	3.8	3.0	2.8
19	6.4	4.3	12.4	6.0	12.0	37.6	11.5	4.3	2.8	3.8	2.8	2.2
20	13.4	4.9	9.9	5.8	9.5	35.7	10.6	4.2	2.8	2.8	2.6	2.0
21	11.0	4.6	8.0	5.6	8.6	28.0	11.3	4.2	2.7	2.4	2.4	1.8
22	9.3	4.2	7.2	5.4	7.9	21.0	11.9	4.2	2.5	2.5	3.4	1.6
23	7.4	3.4	8.6	5.6	7.4	16.6	10.6	5.1	2.4	2.6	3.6	1.4
24	5.7	3.0	17.0	5.4	6.9	13.9	9.7	5.6	2.3	2.9	3.8	1.5
25	5.7	2.7	21.2	5.2	6.4	12.0	9.0	5.8	2.3	3.2	4.0	1.4
26	4.1	2.5	21.9	4.8	6.0	10.7	10.1	7.7	2.3	3.1	4.3	1.4
27	3.8	2.3	21.6	4.6	7.5	9.7	13.0	7.4	2.2	3.0	4.6	1.5
28	3.4	2.3	17.8	4.5	9.3	9.2	14.0	6.6	2.2	2.7	4.8	2.0
29	3.0	2.9	14.4	4.3	9.2	8.8	12.6	5.9	2.2	2.4	2.8	3.1
30	2.9	4.9	11.4	4.2	.....	8.6	13.7	5.6	2.8	2.2	2.7	4.0
31	2.6	.....	9.4	4.2	.....	8.2	.....	5.6	.....	2.0	2.6	.....

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Daily gage height, in feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1881.												
1	3.4	1.2	17.5	4.4	5.9	9.0	8.0	8.8	3.3	2.1	1.0	0.1
2	3.0	1.2	23.4	3.2	6.5	8.8	8.3	8.0	3.4	3.1	.9	.5
3	2.7	1.5	26.5	3.4	10.3	8.1	8.4	7.5	3.6	3.5	.8	.9
4	2.3	2.2	22.0	3.7	11.0	7.7	8.1	7.0	4.4	3.6	.7	1.1
5	2.2	2.0	15.9	4.3	10.2	7.2	7.7	6.9	4.5	3.6	.6	.9
6	1.9	2.2	15.4	6.4	8.8	7.0	7.2	7.2	4.2	3.1	.6	.
7	1.8	2.4	18.1	9.1	7.6	6.6	7.0	7.2	3.9	2.6	.8	.4
8	1.7	2.4	17.4	10.8	7.7	6.9	7.0	6.9	3.9	2.3	.9	.2
9	1.6	2.5	14.6	11.8	9.9	6.8	6.9	6.6	4.0	2.0	1.0	.1
10	1.5	2.9	11.2	11.9	13.6	6.4	7.8	6.4	5.0	1.8	1.1	.1
11	1.4	3.8	8.8	11.8	16.9	6.2	8.7	6.4	5.1	1.6	3.3	.0
12	1.4	4.2	7.5	12.6	19.7	6.1	9.9	5.8	4.6	1.4	3.0	.0
13	1.3	4.2	6.7	11.8	22.4	6.2	12.2	5.5	4.0	1.4	2.3	.0
14	1.2	4.1	6.1	11.2	21.7	6.1	15.8	5.2	3.6	1.6	2.3	.0
15	1.2	4.2	5.7	10.1	18.0	6.1	18.0	5.1	3.6	1.5	1.3	.2
16	1.0	3.7	5.5	9.7	14.7	.....	17.9	4.8	4.0	2.0	1.1	.2
17	1.2	3.4	6.0	9.3	12.0	8.9	16.0	4.6	3.9	2.0	1.0	.2
18	1.2	3.0	5.8	8.6	10.1	10.6	12.8	4.4	3.4	2.1	.6	1.4
19	1.3	2.7	7.3	8.0	10.4	13.9	10.8	4.2	3.3	2.0	1.1	5.0
20	1.2	2.4	7.2	8.6	12.4	19.3	9.7	4.1	2.8	1.8	.7	5.0
21	1.2	2.3	7.0	13.0	14.4	19.2	8.8	4.0	2.6	2.7	.8	11.5
22	1.1	2.2	6.6	17.4	14.4	15.2	8.0	3.8	2.6	2.2	.8	8.0
23	1.1	2.0	6.1	18.8	13.8	12.9	7.9	3.8	3.2	1.8	.5	5.8
24	1.0	1.8	5.8	17.4	11.2	11.4	8.0	3.9	3.0	1.4	.5	4.2
25	1.1	1.8	5.5	15.4	9.7	10.0	8.4	3.9	2.8	1.3	.6	3.4
26	1.1	1.7	5.6	11.3	8.9	9.2	9.0	4.0	2.5	1.6	.6	2.3
27	1.0	1.7	6.0	9.2	8.0	8.7	10.8	3.8	2.3	1.8	.5	2.6
28	1.0	2.3	6.0	8.0	8.7	9.0	11.8	3.6	2.2	1.7	.3	2.6
29	1.1	7.1	5.8	7.0	.....	8.8	10.5	3.4	2.2	1.7	.5	2.8
30	1.0	13.5	5.4	6.5	.....	8.3	9.0	3.3	2.2	1.4	.4	3.0
31	1.1	.....	4.6	6.1	.....	8.1	.....	3.2	.....	1.2	.2	.....
1882.												
1	2.8	6.8	5.0	15.8	29.9	13.2	11.2	6.9	8.4	4.6	4.0	5.6
2	2.7	9.8	5.0	14.1	29.4	19.1	9.9	6.5	8.8	6.0	4.3	5.9
3	2.4	9.2	6.1	11.9	20.0	22.0	8.9	6.0	10.0	6.3	4.8	6.3
4	2.2	8.4	6.1	10.1	18.2	20.0	8.4	5.6	9.1	6.1	6.2	5.4
5	1.7	6.6	5.9	8.9	22.2	17.7	7.9	5.2	8.6	5.9	6.1	5.2
6	1.3	5.3	5.8	9.4	24.4	14.8	7.4	5.0	8.0	6.9	6.3	4.8
7	1.2	4.6	5.4	13.5	23.0	13.3	7.2	5.3	7.9	6.6	6.0	4.2
8	1.1	4.6	4.9	21.5	19.6	13.4	7.4	5.2	6.5	5.6	5.4	3.8
9	1.0	4.2	4.6	26.8	18.6	15.8	8.0	5.1	5.7	4.9	4.9	4.1
10	.9	6.0	4.2	29.5	20.0	18.9	8.5	4.9	5.3	4.3	4.7	4.3
11	.9	6.2	3.8	29.8	22.7	21.1	9.7	6.2	4.9	3.9	4.4	5.4
12	.8	6.4	3.7	29.9	23.4	17.3	9.5	5.7	4.7	3.8	4.1	12.1
13	.8	6.6	3.4	30.3	23.6	15.5	8.8	5.2	4.5	3.9	3.9	21.8
14	.8	6.8	4.3	30.6	22.0	14.8	9.2	6.8	4.7	4.2	3.7	22.8
15	.7	6.6	11.8	30.3	20.5	13.5	7.6	5.9	5.0	5.0	3.4	17.2
16	.7	5.9	17.4	30.2	21.3	11.2	7.2	5.7	4.8	6.5	3.2	10.8
17	.6	5.2	16.8	33.6	22.0	9.9	7.0	5.3	4.7	5.9	3.2	7.7
18	.6	4.6	15.3	37.6	20.5	10.1	6.5	5.3	5.7	4.8	4.0	6.4
19	.5	4.0	12.0	40.2	18.2	11.5	6.1	5.0	7.9	4.1	5.2	5.5
20	.6	3.7	8.8	40.1	16.7	10.2	5.8	4.6	8.1	4.0	5.1	4.8
21	.5	3.4	7.9	39.2	15.5	9.8	5.6	4.5	7.2	4.3	4.6	4.4
22	.4	3.2	15.4	38.8	14.3	9.9	5.5	5.1	6.4	4.3	3.8	4.5
23	.8	3.4	20.2	38.8	13.6	9.8	8.1	5.6	6.0	4.2	3.2	4.0
24	1.0	6.0	18.4	37.7	12.7	9.8	10.2	5.7	6.1	4.0	2.8	3.8
25	1.0	9.8	15.6	34.5	11.6	9.4	10.1	5.8	6.2	3.7	2.5	3.6
26	.9	9.7	14.8	27.3	10.6	8.8	9.5	5.6	6.3	3.4	2.4	3.4
27	1.1	10.0	14.2	18.2	9.7	8.7	9.0	6.8	6.1	3.3	2.8	3.2
28	1.2	8.6	14.9	14.8	9.3	10.4	8.2	6.6	5.1	3.4	3.0	3.0
29	1.3	6.5	15.7	21.2	.....	13.3	7.7	7.5	5.0	3.6	3.8	2.9
30	2.0	5.6	16.9	29.5	.....	13.6	7.2	8.7	4.7	3.7	4.2	2.9
31	3.1	.....	16.6	30.3	.....	12.6	.....	8.7	.....	3.4	4.7	.....

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Daily gage height, in feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1883.												
1	3.0	2.4	4.7	4.5	9.4	7.9	15.1	11.0	3.8	4.1	1.5	1.5
2	2.8	2.7	4.2	4.4	9.0	7.3	24.2	10.3	3.8	4.0	1.4	1.3
3	2.8	2.9	3.7	4.1	8.1	6.9	26.2	9.2	3.5	3.6	1.5	1.1
4	2.7	2.7	3.3	3.8	7.6	6.6	23.6	8.4	3.3	3.3	1.6	.9
5	2.6	2.5	3.0	3.9	7.5	6.2	16.8	7.8	3.2	3.0	1.9	.8
6	2.6	2.2	2.8	4.5	7.8	6.0	12.7	7.3	3.4	2.9	1.6	.7
7	2.5	2.0	2.7	7.4	9.4	6.5	13.8	6.9	3.7	2.7	1.5	.6
8	2.4	1.9	2.5	11.3	10.9	8.3	16.2	6.6	4.8	2.7	1.7	.5
9	2.2	1.8	2.2	12.8	14.8	9.7	17.0	6.2	5.4	2.8	2.0	.4
10	2.2	1.8	2.2	12.4	17.6	9.8	16.9	6.0	5.3	2.9	1.9	.4
11	2.0	1.7	2.3	11.3	16.4	9.3	17.0	5.9	5.1	2.9	1.6	.3
12	1.9	1.7	3.7	9.4	14.5	8.5	17.4	5.9	4.7	3.2	1.3	.2
13	1.8	1.8	3.4	8.3	13.3	8.2	18.3	5.8	5.6	4.0	1.2	.2
14	1.8	2.0	3.3	9.5	13.5	7.9	18.7	5.6	6.0	4.0	1.3	.1
15	1.8	2.7	3.4	14.4	13.1	7.1	17.2	5.4	6.9	3.6	1.4	.1
16	1.8	2.8	3.3	16.6	11.8	6.7	15.6	5.4	6.5	3.5	1.5	.1
17	1.8	2.7	3.1	15.8	10.8	6.4	14.0	5.4	5.8	3.2	2.4	.1
18	1.7	2.6	2.9	17.0	10.0	6.1	15.1	5.2	5.0	2.8	2.3	.1
19	1.8	2.4	2.5	19.8	9.9	5.8	15.6	4.9	4.5	3.0	2.6	.0
20	2.0	2.2	2.6	22.6	10.4	5.6	14.7	4.8	4.1	2.8	2.5	.1
21	2.9	2.3	3.4	30.1	10.4	5.5	12.6	4.5	3.7	2.3	2.1	.2
22	4.3	2.6	4.4	35.2	9.8	5.4	11.1	4.5	3.6	2.1	1.8	.5
23	4.0	2.6	6.7	38.2	9.1	5.2	17.6	4.5	3.5	1.8	1.6	.7
24	3.4	2.5	9.1	37.9	8.8	5.0	26.8	4.6	3.8	1.6	1.4	1.7
25	3.2	2.2	10.0	33.0	9.2	5.0	31.4	4.5	4.6	1.6	1.4	2.0
26	2.7	2.0	9.2	22.2	9.3	5.8	32.5	4.4	4.2	1.6	1.3	1.9
27	2.2	2.0	8.1	13.7	9.1	6.3	28.6	4.3	3.9	1.8	1.7	2.3
28	2.1	2.1	7.1	11.0	8.4	6.3	19.8	4.3	4.2	2.0	1.3	2.5
29	2.0	3.1	5.9	10.0	.....	6.4	13.8	4.3	4.1	1.8	1.3	2.2
30	1.9	4.2	5.3	9.7	.....	6.3	11.9	4.0	4.2	1.5	1.5	1.9
31	2.0	.....	4.9	9.6	.....	7.4	.....	3.9	.....	1.4	1.6	.....
1884.												
1	1.5	3.3	4.3	6.6	11.5	9.5	11.5	10.1	4.1	8.3	6.1	3.2
2	1.2	3.5	3.9	6.4	19.5	9.1	10.6	9.2	3.9	7.3	9.8	2.7
3	1.6	3.1	3.5	6.1	24.6	8.6	10.1	8.9	3.8	6.8	7.2	2.2
4	1.3	2.7	3.1	5.9	25.5	8.2	9.9	9.0	3.8	7.0	5.5	2.0
5	1.4	2.1	2.9	5.5	20.4	7.9	9.4	8.9	3.5	6.7	6.0	1.7
6	1.8	1.8	2.7	5.1	13.7	15.4	8.8	10.2	3.4	6.5	5.1	1.5
7	1.7	1.6	2.5	4.5	13.3	29.3	8.2	11.4	5.0	6.5	4.0	1.3
8	2.8	1.4	2.5	3.9	21.7	36.7	9.0	10.5	5.4	6.0	3.5	1.2
9	6.1	1.4	3.0	3.5	30.4	40.9	8.5	9.4	5.4	5.8	3.2	1.3
10	4.8	1.3	3.6	3.4	35.1	42.8	7.3	8.4	5.2	5.0	3.1	1.5
11	3.7	1.4	4.1	3.6	36.8	42.3	7.0	7.9	5.9	4.9	3.2	1.6
12	2.8	1.8	3.7	5.1	36.4	40.2	6.8	7.0	7.3	5.1	3.5	1.5
13	2.3	2.6	3.6	8.7	34.0	37.3	6.5	6.9	8.4	5.9	3.5	1.5
14	1.8	3.3	3.3	9.4	31.0	35.7	6.6	6.4	8.6	5.6	3.4	1.3
15	1.6	3.4	3.2	10.0	29.6	33.6	9.5	6.2	8.8	5.0	3.2	1.2
16	1.3	2.9	3.3	12.0	28.7	30.2	14.5	6.0	8.5	4.8	3.1	1.1
17	1.1	2.5	3.5	12.9	26.7	24.9	16.9	5.8	7.0	4.2	2.8	1.0
18	1.1	2.2	3.2	12.1	25.1	19.9	15.1	5.5	6.3	3.8	2.5	1.0
19	1.0	2.1	3.2	12.4	25.5	17.6	13.1	5.2	6.0	4.2	2.2	1.0
20	.9	1.8	3.3	13.8	27.0	18.6	11.2	5.2	5.3	4.2	2.0	.9
21	.9	1.6	5.1	14.8	26.9	22.4	10.0	4.9	4.7	4.0	1.9	.9
22	.9	2.1	5.5	13.7	23.2	25.8	11.4	5.0	4.2	3.5	2.0	.8
23	.9	6.2	5.3	12.0	18.7	27.6	13.6	5.0	4.1	3.2	1.9	.8
24	1.2	9.9	5.7	11.0	15.7	27.1	13.8	4.7	4.2	2.9	2.0	.8
25	1.5	10.9	7.0	11.2	13.3	24.0	15.1	4.8	4.1	2.6	2.2	.7
26	1.8	9.3	10.7	10.8	11.7	21.0	15.4	4.8	4.2	2.8	2.2	.7
27	1.5	7.6	12.8	9.3	10.3	20.5	13.6	4.8	5.0	3.0	2.0	.7
28	1.3	6.1	13.0	8.6	9.8	19.9	12.1	5.4	10.8	3.2	1.8	.6
29	1.5	5.3	10.3	7.9	9.6	19.2	11.6	5.2	11.4	3.9	1.8	.6
30	1.7	4.8	7.9	7.5	.....	16.0	11.4	4.6	10.0	4.1	1.9	.6
31	2.2	.....	7.0	7.5	.....	13.1	.....	4.3	.....	3.9	2.1	.....

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Daily gage height, in feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1915—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1885.												
1	0.6	1.2	1.5	3.6	7.9	8.5	6.3	4.6	18.6	5.5	3.1	1.5
2	.7	1.2	1.5	3.7	7.2	8.1	6.1	4.5	16.9	4.7	3.0	1.6
3	.7	1.1	1.3	3.9	6.9	7.9	5.9	4.5	12.8	4.0	2.8	1.8
4	.6	1.1	1.2	3.9	6.7	7.8	5.9	4.5	9.5	3.6	2.9	1.8
5	.5	1.0	1.1	3.6	6.4	7.8	6.0	4.5	7.7	3.5	3.1	1.6
6	.5	1.0	1.1	3.9	6.3	7.5	6.4	4.3	6.6	3.7	3.5	1.4
7	.5	1.0	1.1	5.5	6.3	6.9	6.0	4.2	5.8	5.0	3.2	1.4
8	.4	1.0	1.2	6.8	6.5	6.3	5.8	4.0	5.8	5.4	2.9	1.5
9	.4	1.0	1.8	6.9	6.8	5.9	5.6	5.6	5.4	4.3	2.9	1.5
10	.4	.8	2.1	6.6	7.7	5.6	5.4	6.0	5.4	3.9	3.2	1.5
11	.4	.7	2.3	6.1	8.8	5.3	5.2	5.8	5.4	3.6	2.9	1.4
12	.3	.7	2.2	9.2	9.6	5.0	5.0	5.6	5.1	3.5	2.5	1.3
13	.3	.7	2.0	16.0	9.4	5.1	4.8	5.0	4.8	3.0	2.5	1.2
14	.3	.7	2.3	17.6	9.0	5.6	4.6	4.6	4.6	3.2	3.4	1.2
15	.2	.7	3.7	14.8	7.9	7.0	4.4	4.3	4.3	3.4	3.8	1.1
16	.2	.7	4.1	16.0	7.3	7.4	4.2	4.0	4.0	3.7	4.4	1.1
17	.2	.6	4.5	22.5	6.8	8.6	4.1	3.8	4.0	4.5	4.2	1.0
18	.2	.7	4.2	26.5	6.6	9.2	4.5	3.7	4.2	4.4	3.6	1.0
19	.2	.7	4.1	24.5	6.0	8.6	6.4	3.5	4.7	3.7	3.2	.9
20	.2	.8	3.6	18.4	6.0	7.8	12.7	3.4	4.6	3.1	2.8	.7
21	.2	1.0	3.5	14.4	5.8	7.1	15.5	3.5	4.6	2.8	2.6	1.8
22	.2	1.0	9.0	10.4	5.4	6.7	10.8	4.5	4.1	2.9	2.2	2.2
23	.2	1.0	12.6	8.3	5.0	6.2	8.0	4.6	4.0	2.9	2.1	2.2
24	.3	.9	12.5	8.4	5.0	6.0	6.8	5.0	4.0	2.9	1.9	2.2
25	.4	.9	10.7	11.4	6.0	5.7	6.0	5.6	3.8	2.8	1.8	1.9
26	.6	1.3	9.8	15.6	7.6	5.4	5.6	6.2	3.5	2.8	1.7	1.9
27	.7	1.8	7.0	14.9	8.4	5.2	5.2	6.8	3.4	2.8	1.6	1.6
28	.8	1.7	5.6	13.4	8.5	5.1	5.0	8.0	3.6	3.1	1.4	1.4
29	.8	1.8	4.8	11.8	.....	5.2	4.8	8.3	4.4	3.4	1.4	1.3
30	1.0	1.5	4.2	10.1	.....	5.8	4.7	10.3	4.9	3.8	1.3	1.5
31	1.0	.....	3.8	8.8	.....	6.3	.....	14.0	.....	3.4	1.3	.....
1886.												
1	2.7	16.2	5.0	5.1	10.0	10.0	47.1	6.4	7.6	7.0	4.4	3.4
2	8.6	14.0	4.6	5.2	9.3	9.4	51.0	6.5	7.8	6.8	4.2	3.3
3	7.6	11.0	5.3	8.1	8.5	9.0	52.2	6.7	8.3	9.8	5.0	3.3
4	6.1	8.2	5.8	18.0	8.0	7.5	50.3	6.7	8.0	11.6	5.6	3.2
5	5.0	6.8	6.0	22.1	7.6	7.0	45.6	7.3	8.0	11.3	6.0	3.2
6	4.6	6.5	5.8	21.8	7.2	6.8	41.4	7.8	8.3	11.0	6.6	3.2
7	3.7	11.0	5.7	20.3	7.0	6.2	39.7	8.9	8.2	12.5	7.0	3.0
8	3.0	25.0	5.4	19.5	6.2	6.0	39.3	9.0	8.0	13.0	7.1	2.9
9	2.7	30.4	6.0	14.5	5.8	5.8	38.2	9.3	9.0	13.6	6.7	2.7
10	2.3	29.0	8.7	12.3	5.5	5.5	33.9	10.0	10.1	13.8	6.4	2.6
11	2.1	25.7	10.8	8.8	6.8	5.4	24.0	10.5	10.6	11.0	6.0	2.5
12	2.0	18.4	8.2	.....	9.0	5.0	16.4	10.8	13.0	10.0	5.8	2.5
13	2.3	12.5	8.4	.....	12.6	5.2	13.9	9.5	13.6	9.4	5.5	2.5
14	3.6	9.7	15.8	.....	13.1	5.4	12.0	8.8	14.0	9.0	5.4	2.4
15	6.1	8.6	20.8	5.2	11.6	5.8	10.5	8.2	12.0	8.6	5.0	2.8
16	6.1	7.6	21.4	7.3	10.6	6.0	9.8	7.8	10.5	8.2	4.8	3.0
17	5.0	6.9	19.4	9.9	9.4	5.8	9.0	6.4	10.3	8.0	4.8	3.1
18	4.1	6.4	18.0	12.4	8.5	5.5	8.9	6.0	10.6	7.7	4.6	3.0
19	3.6	6.0	11.2	12.6	8.0	5.4	8.5	5.7	11.2	7.4	4.5	2.9
20	3.8	5.9	10.2	12.7	7.2	5.0	8.3	7.6	10.8	7.0	4.4	2.8
21	3.1	5.6	9.1	12.8	6.8	8.4	8.1	8.3	10.6	6.5	4.3	2.6
22	4.4	5.4	7.4	12.9	6.5	12.4	7.8	9.8	12.2	6.1	4.1	2.4
23	3.3	5.4	6.1	14.0	6.2	14.5	7.4	10.5	16.0	5.8	4.0	2.3
24	3.3	6.0	6.4	15.0	6.0	14.3	6.9	9.0	14.0	5.5	4.0	2.3
25	2.8	6.0	6.2	14.4	5.8	11.9	6.7	8.4	12.8	5.4	4.5	2.2
26	2.7	5.8	6.1	13.8	6.8	9.2	6.5	8.8	11.6	5.2	5.2	2.1
27	2.4	5.2	5.9	12.5	7.4	8.5	6.4	9.2	9.6	5.0	4.4	2.0
28	2.4	4.8	5.8	12.4	10.0	11.8	6.4	8.8	8.5	4.9	3.8	2.0
29	4.6	4.8	5.4	11.6	.....	17.0	6.1	8.4	8.0	4.7	3.6	2.0
30	9.9	4.4	5.1	10.4	.....	30.5	6.0	8.2	7.2	4.6	3.5	2.0
31	15.5	.....	5.0	10.3	.....	40.5	.....	7.8	.....	4.6	3.5	.....

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Daily gage height, in feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1887.												
1	1.9	1.7	6.5	11.0	16.2	27.3	5.2	6.6	6.8	3.6	3.6	4.0
2	1.9	1.6	5.6	10.5	12.7	20.0	5.2	6.2	8.0	3.5	3.4	3.4
3	1.8	1.5	5.0	10.0	10.3	17.1	5.1	6.0	9.1	3.4	3.3	3.0
4	1.8	1.5	4.8	9.0	14.1	14.5	5.0	5.8	9.5	3.4	3.5	2.8
5	1.8	1.4	4.5	8.2	19.0	11.2	5.0	5.7	9.4	3.4	8.4	2.6
6	1.8	1.4	4.5	7.5	21.0	9.2	5.0	5.6	9.3	3.3	10.6	2.4
7	1.8	1.4	5.1	7.0	21.8	8.0	5.0	5.6	10.1	3.7	9.1	2.2
8	1.7	1.4	5.2	6.4	15.2	7.4	5.0	5.6	10.4	4.6	8.2	2.2
9	1.6	1.6	5.2	6.0	11.9	16.0	4.9	5.9	9.7	5.4	7.7	2.1
10	1.6	1.5	4.6	5.8	10.9	21.7	4.9	5.5	9.5	5.6	6.3	2.0
11	1.6	1.4	4.2	5.6	9.7	24.0	4.9	5.4	8.9	5.0	5.7	2.0
12	1.6	1.4	4.0	5.3	9.7	19.4	4.8	5.4	8.5	4.4	5.0	1.8
13	1.6	1.4	7.0	5.0	9.2	14.3	4.8	5.3	7.0	3.8	4.5	1.7
14	1.5	1.4	8.2	5.0	8.6	10.3	4.7	5.3	5.9	3.1	4.2	1.7
15	1.4	1.8	9.0	5.5	9.0	9.8	4.7	5.2	5.5	2.8	3.9	1.6
16	1.4	2.0	9.6	6.2	12.8	8.9	4.6	5.1	5.2	2.5	3.8	1.5
17	1.4	2.4	11.6	6.8	13.4	8.0	4.6	5.0	5.0	2.3	3.6	1.5
18	1.4	2.8	10.1	7.0	12.4	7.5	4.5	5.0	4.9	2.0	3.6	1.4
19	1.3	5.2	9.0	6.5	11.5	7.0	4.4	4.8	4.8	2.0	4.1	1.3
20	1.3	6.5	14.0	6.1	10.6	6.6	4.3	4.7	4.6	1.9	4.1	1.4
21	1.3	7.5	16.0	5.7	17.0	6.2	4.2	4.7	4.5	2.1	4.3	1.4
22	1.3	6.0	16.6	5.4	19.0	5.9	4.2	4.6	4.5	2.2	4.0	1.4
23	1.2	7.0	11.2	5.1	17.8	5.6	10.0	4.6	4.5	2.6	3.8	1.4
24	1.2	10.6	8.6	13.0	19.0	6.4	15.2	4.6	4.7	3.2	3.7	1.4
25	1.2	12.6	7.0	19.6	23.2	6.1	18.0	5.2	4.8	3.4	3.3	1.3
26	1.2	13.0	6.6	21.8	25.3	5.8	20.0	5.8	4.6	3.2	3.3	1.4
27	1.3	13.4	6.9	20.8	26.8	5.6	21.2	6.0	4.5	3.2	3.6	1.5
28	1.7	13.7	7.9	17.4	27.3	5.5	16.0	6.0	4.0	3.4	4.8	1.9
29	2.0	11.0	10.0	14.0	.....	5.4	11.0	5.5	3.8	3.4	5.8	2.2
30	2.0	10.0	10.6	13.8	.....	5.3	7.3	5.1	3.7	3.5	5.4	2.4
31	1.8	.....	10.7	15.3	.....	5.2	.....	5.0	.....	3.6	4.6	.....
1888.												
1	3.1	3.0	1.7	8.0	5.4	8.0	23.6	4.6	8.3	7.1	2.0	3.5
2	3.4	2.7	1.6	14.5	5.3	7.0	18.1	4.6	8.4	6.0	2.6	6.0
3	3.7	2.4	1.6	14.7	5.2	6.4	14.2	4.6	9.2	5.0	2.4	7.9
4	3.5	2.3	1.6	11.5	5.4	6.0	11.2	4.3	7.9	4.4	2.4	7.0
5	2.8	2.2	1.6	9.7	6.2	5.9	10.1	4.2	7.0	4.0	2.6	6.6
6	2.4	2.1	1.6	8.1	6.8	5.7	8.9	4.2	6.0	3.7	2.8	6.5
7	2.0	2.0	1.7	6.8	7.0	5.5	8.1	4.1	5.4	3.8	3.3	7.5
8	1.7	2.0	1.8	6.1	7.2	5.3	8.1	4.0	5.0	3.8	2.9	7.4
9	1.6	1.9	2.1	5.8	7.5	5.0	8.1	4.1	4.6	3.7	2.8	9.6
10	1.5	1.9	3.2	7.4	8.3	4.9	11.0	4.5	4.4	3.7	2.6	9.4
11	1.5	2.0	3.9	10.2	9.4	5.4	19.7	4.9	4.4	3.5	2.5	9.1
12	1.4	2.0	3.6	10.9	10.9	5.5	22.4	5.0	4.2	3.4	2.9	9.0
13	1.4	2.2	3.6	11.2	11.2	5.9	18.4	5.1	4.0	3.8	3.0	11.2
14	1.3	2.3	4.1	13.2	10.3	5.1	13.9	4.9	4.0	3.7	2.8	10.5
15	1.2	2.1	3.9	14.5	9.5	5.7	11.2	4.9	4.1	3.7	2.8	9.7
16	1.2	2.0	3.6	13.1	9.0	5.6	9.5	4.8	4.0	3.5	2.9	6.0
17	1.2	1.9	3.5	14.9	8.4	5.3	8.4	4.5	4.0	3.1	2.7	8.6
18	1.3	1.9	4.1	21.4	7.5	5.1	7.6	4.4	3.9	3.1	2.2	11.3
19	1.3	1.9	3.9	25.7	6.8	4.9	7.2	4.8	3.8	3.0	2.0	11.5
20	1.4	1.8	3.9	24.8	6.4	4.8	6.9	5.0	3.7	3.5	2.0	10.7
21	1.5	1.8	3.8	20.2	6.6	5.2	6.4	5.0	3.6	2.8	2.2	9.0
22	1.6	1.6	3.8	14.6	6.6	5.7	6.0	5.1	3.6	3.0	2.7	7.4
23	1.6	1.5	3.6	11.0	6.4	6.4	5.8	5.0	3.7	3.0	4.9	6.6
24	1.7	1.5	3.4	9.2	6.3	6.6	5.6	7.8	3.6	3.0	6.2	7.6
25	2.0	1.4	3.9	7.8	9.4	7.2	5.4	9.6	3.4	2.4	5.0	7.1
26	2.7	1.4	3.6	7.4	11.2	11.6	5.1	9.6	3.6	2.6	4.2	6.5
27	3.9	1.4	3.7	7.0	11.1	22.6	5.0	8.8	2.8	2.0	3.4	5.5
28	4.7	1.6	4.1	6.6	9.9	22.5	4.8	7.4	3.9	1.9	3.0	4.9
29	4.3	1.6	4.9	6.1	8.8	19.8	4.7	7.6	6.8	1.8	3.2	4.5
30	3.9	1.6	5.5	5.9	.....	24.5	4.6	7.8	7.5	2.0	2.4	4.0
31	3.4	.....	5.4	5.6	.....	27.0	.....	8.1	.....	2.0	2.6	.....

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Daily gage height, in feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1889.												
1	3.8	8.4	5.5	5.5	14.6	7.7	4.7	4.6	7.6	5.0	7.6	4.2
2	3.5	6.5	5.3	5.8	13.5	7.2	5.1	4.4	8.0	5.2	8.3	4.0
3	3.4	7.4	5.1	5.6	12.8	6.9	5.5	4.5	12.4	5.6	9.7	3.8
4	3.3	7.1	4.9	6.2	11.6	6.9	5.4	4.6	11.2	6.0	10.1	3.9
5	3.1	6.7	4.7	6.3	10.5	7.6	5.1	4.5	7.8	6.8	10.1	4.0
6	4.0	6.4	4.5	8.5	9.8	7.8	4.9	4.9	7.3	8.2	9.3	6.2
7	3.2	5.9	4.4	9.4	8.9	7.3	4.6	5.0	5.6	8.0	9.2	6.9
8	2.8	5.4	4.2	10.4	7.6	6.8	4.1	4.6	5.1	7.0	8.6	5.7
9	4.6	5.8	4.0	11.3	7.5	6.3	3.9	4.2	4.7	5.9	7.4	4.6
10	5.3	13.6	4.3	12.2	8.1	5.8	3.6	3.9	4.5	5.2	6.7	4.1
11	5.7	20.9	4.5	12.4	8.8	5.4	3.3	3.7	4.4	4.6	5.7	4.0
12	5.8	21.0	4.7	11.8	8.7	4.9	3.3	3.6	4.2	4.0	5.1	3.7
13	6.0	18.5	4.9	10.9	8.0	4.5	3.2	3.4	5.0	4.0	5.0	3.6
14	4.2	17.5	5.1	9.1	6.8	4.0	3.9	3.3	5.8	3.8	5.6	3.2
15	5.5	18.0	5.6	8.1	6.2	3.7	4.6	3.2	7.2	4.2	5.6	3.0
16	5.7	15.8	5.1	7.5	6.6	3.3	5.6	3.4	10.0	5.1	6.6	2.7
17	5.3	15.4	4.2	7.9	20.0	3.2	6.4	3.3	10.6	5.3	7.4	2.4
18	4.8	15.0	4.3	8.9	29.6	3.5	7.4	3.4	10.4	6.0	6.5	7.6
19	4.4	16.1	4.5	9.6	29.2	5.9	7.9	3.8	10.7	5.8	6.4	8.0
20	4.2	16.6	4.8	10.6	27.2	7.3	8.2	3.6	10.3	5.2	5.6	7.2
21	4.0	10.8	5.5	11.3	29.0	8.9	8.1	3.4	9.0	4.6	4.9	6.4
22	4.2	10.0	6.6	12.0	27.1	9.5	7.8	3.2	8.2	4.4	4.4	4.8
23	4.9	8.6	6.9	12.3	21.0	9.3	7.2	3.0	7.4	4.0	4.1	4.3
24	5.2	7.9	6.1	12.2	16.0	8.7	5.6	2.8	6.4	3.8	3.8	4.8
25	7.6	7.2	5.7	9.8	10.1	8.0	4.1	2.8	5.6	3.6	4.3	7.4
26	10.7	7.0	5.1	8.5	8.5	7.4	4.0	2.7	4.8	3.5	4.3	7.4
27	13.4	6.6	4.6	9.2	8.3	6.9	4.0	2.7	4.0	3.6	4.5	6.7
28	20.0	6.1	4.2	10.2	8.0	6.5	3.9	2.7	4.0	4.8	4.5	6.8
29	18.5	5.9	4.7	11.6	.....	5.8	4.1	2.8	3.9	7.5	4.2	6.4
30	15.5	5.7	4.7	13.0	.....	5.1	4.4	3.0	5.2	9.0	4.1	5.5
31	11.5	.....	4.5	14.0	.....	4.6	.....	3.5	.....	9.2	4.3	.....
1890.												
1	4.8	2.7	7.7	4.9	8.0	40.2	10.0	7.5	6.1	3.2	5.8	7.6
2	4.5	2.7	7.6	5.2	7.3	42.5	9.8	7.1	5.6	2.9	5.2	5.6
3	4.3	2.8	7.4	5.1	7.3	41.0	9.4	6.7	5.3	2.9	4.7	5.7
4	3.9	4.7	6.6	5.0	7.4	34.4	9.7	6.8	5.3	3.0	4.7	4.0
5	3.6	4.8	6.0	5.0	7.2	23.0	12.2	7.0	5.2	3.0	4.8	3.6
6	3.3	5.4	5.6	4.8	7.8	15.1	14.0	7.5	5.3	3.0	4.5	3.2
7	3.1	4.8	5.4	4.7	8.3	14.2	13.6	8.9	5.2	3.0	5.2	3.6
8	2.8	4.8	5.2	4.6	11.5	14.4	13.4	9.1	4.9	2.9	5.7	3.2
9	2.7	6.6	5.0	4.7	19.3	12.8	11.9	8.7	4.7	2.8	6.6	2.8
10	2.6	8.9	4.9	4.9	20.4	11.2	10.5	8.7	4.5	2.7	7.5	2.8
11	2.5	11.3	4.7	4.7	17.8	10.0	9.6	8.1	4.5	2.7	7.2	3.0
12	2.4	10.0	4.6	4.6	14.7	9.2	8.7	7.7	4.4	3.0	6.3	3.4
13	2.4	8.7	4.4	4.6	12.0	8.6	8.0	7.2	4.0	2.7	5.8	3.6
14	2.3	9.1	4.3	4.9	10.0	8.7	7.5	6.7	3.9	2.5	5.2	4.6
15	2.2	9.5	4.2	4.6	9.8	9.7	7.1	6.6	4.0	2.3	4.8	4.0
16	2.2	8.7	4.0	5.4	9.6	13.7	6.9	7.8	4.1	2.1	4.2	4.0
17	2.3	8.5	3.9	7.2	9.0	15.1	7.1	9.3	4.0	2.0	3.8	3.7
18	2.3	10.3	3.8	9.2	9.3	14.9	9.4	8.6	3.9	3.2	3.7	4.0
19	2.3	10.5	3.7	8.2	8.5	13.0	16.6	7.9	3.7	4.7	3.3	5.3
20	2.2	10.9	3.6	7.5	7.8	11.7	20.4	8.8	3.6	4.7	3.1	3.7
21	2.2	11.3	3.6	7.0	7.3	12.4	18.2	10.7	3.7	4.1	2.6	3.7
22	2.1	9.9	3.5	9.6	7.1	14.0	14.3	11.9	3.8	3.5	2.5	5.8
23	2.2	9.5	3.5	13.0	7.2	20.0	11.3	11.9	3.7	3.2	3.8	3.5
24	2.1	10.3	3.8	12.3	7.4	25.5	9.6	11.6	3.8	3.2	4.0	3.3
25	2.2	10.0	4.0	11.7	12.1	27.2	8.7	9.2	4.0	4.1	3.3	3.4
26	2.3	9.5	4.0	10.0	18.7	26.0	8.4	7.8	4.0	5.9	3.8	4.0
27	2.4	8.0	3.8	8.3	26.4	21.4	8.4	7.4	3.9	7.5	3.6	4.3
28	2.4	7.4	3.7	7.3	24.8	15.4	8.5	8.0	3.9	7.7	3.0	4.0
29	2.4	7.4	3.6	6.6	.....	13.0	8.4	8.1	3.5	7.0	3.8	3.8
30	2.6	7.9	4.4	7.7	.....	11.9	8.1	7.4	3.1	6.3	5.4	5.3
31	2.8	.....	4.8	8.3	.....	10.7	.....	6.8	.....	6.2	6.5	.....

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Daily gage height, in feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1891.												
1	9.4	6.8	2.4	7.7	9.8	18.6	15.4	5.9	5.8	3.9	8.3	5.4
2	8.1	6.6	2.4	7.8	13.2	17.5	16.3	5.7	5.6	3.8	10.3	4.7
3	7.7	5.7	2.3	9.9	16.1	15.6	16.3	5.6	5.3	3.6	15.1	4.3
4	7.2	5.3	2.3	14.1	19.8	13.3	15.7	5.5	4.8	3.6	16.4	4.2
5	6.4	5.0	2.3	15.5	22.6	15.4	15.1	5.2	4.4	3.6	12.0	5.1
6	5.7	4.6	2.5	15.2	21.6	20.0	12.6	5.1	4.1	3.6	8.7	5.1
7	5.2	4.4	2.8	10.4	18.3	23.6	11.6	4.9	3.9	3.4	6.9	5.2
8	5.2	4.3	2.9	8.2	16.9	29.1	10.8	4.7	4.1	3.2	5.8	5.2
9	5.5	4.0	7.1	7.1	14.5	34.5	9.8	4.6	4.6	3.3	5.1	5.8
10	5.3	3.9	8.1	6.3	21.0	37.5	9.6	4.5	4.7	4.5	4.6	4.9
11	4.8	3.8	8.2	6.5	27.8	38.9	9.8	4.4	5.5	5.1	4.4	4.4
12	4.6	3.6	7.7	8.9	34.3	37.6	9.9	4.3	7.0	4.4	4.0	3.9
13	4.4	3.5	7.4	10.7	36.5	33.5	10.6	4.2	6.5	3.9	4.0	3.6
14	4.2	3.4	6.4	10.0	37.5	27.0	11.3	4.1	5.7	3.5	3.9	3.5
15	3.9	3.3	3.7	9.2	35.5	22.2	12.2	4.2	5.5	3.1	3.8	3.5
16	3.7	3.2	4.2	7.3	29.0	19.8	10.8	4.2	5.7	2.9	3.6	3.5
17	3.7	3.2	3.9	7.8	21.1	18.1	9.4	4.5	5.8	2.8	3.5	3.5
18	3.7	3.0	3.9	7.5	19.7	15.3	8.4	4.7	6.1	2.7	3.4	3.2
19	4.2	3.2	4.0	7.5	18.2	13.5	8.2	4.7	6.8	4.1	3.0	2.9
20	4.0	3.1	4.0	7.6	16.5	12.3	7.9	4.6	7.3	5.0	3.0	2.7
21	4.0	3.1	3.9	7.3	15.5	11.3	7.9	4.5	6.8	4.5	3.4	2.6
22	3.8	3.1	3.9	8.2	18.8	10.8	7.6	4.3	6.8	4.0	4.0	2.5
23	5.3	2.9	3.9	12.5	24.0	10.7	7.4	4.1	6.5	3.8	4.6	2.4
24	7.2	2.8	3.9	15.3	27.7	10.8	7.4	4.0	7.1	3.6	5.5	2.3
25	8.8	2.8	4.3	14.0	29.0	10.6	7.5	3.8	7.4	3.5	5.6	2.2
26	9.2	2.7	4.6	13.6	28.7	10.4	7.5	3.9	7.6	3.5	7.7	2.2
27	9.5	2.6	9.4	11.2	26.6	10.5	7.4	4.0	6.2	3.5	8.2	2.1
28	8.6	2.6	12.5	9.7	19.0	14.1	7.2	4.1	4.9	3.6	8.1	2.0
29	7.6	2.5	12.9	7.9	.....	13.6	6.5	4.1	4.3	3.7	7.0	1.9
30	7.1	2.4	12.4	7.9	.....	13.0	6.2	4.7	4.1	3.8	6.4	1.9
31	7.0	.....	9.3	8.9	.....	13.1	.....	5.3	.....	5.7	6.1	.....
1892.												
1	1.8	1.3	3.7	6.6	6.5	5.7	9.1	8.7	5.6	6.6	4.2	2.1
2	1.9	1.3	3.2	6.6	6.2	5.6	8.3	8.2	5.4	5.6	4.1	1.8
3	1.9	1.3	2.9	8.1	6.0	5.5	7.4	7.6	5.5	5.5	4.2	1.7
4	1.8	1.2	2.8	8.8	5.8	5.3	6.8	7.3	5.8	5.4	4.0	1.5
5	1.8	1.2	5.6	8.7	5.5	5.1	6.5	7.4	8.8	6.6	4.1	1.3
6	1.7	1.2	6.1	8.4	5.4	5.0	8.5	7.0	9.2	8.9	4.9	2.2
7	1.7	1.2	6.6	9.0	5.3	4.9	21.7	6.6	9.3	11.2	4.2	2.1
8	1.6	1.2	8.6	9.8	5.8	5.0	31.6	6.3	8.7	11.8	3.8	2.0
9	1.7	1.2	10.8	10.0	8.1	6.0	34.2	6.2	8.6	10.1	3.5	2.0
10	1.7	1.2	10.9	9.3	11.5	7.1	34.3	5.9	8.3	8.6	3.3	1.9
11	1.8	1.5	10.2	8.1	11.3	8.0	31.0	5.5	7.8	9.0	3.3	2.0
12	1.8	1.7	8.5	8.3	10.5	7.9	26.6	5.7	8.0	9.5	3.1	1.8
13	1.7	2.7	6.8	11.2	8.9	7.6	18.0	5.7	8.1	9.4	3.5	2.1
14	1.7	3.6	5.7	22.9	7.7	7.6	12.9	5.5	7.8	8.9	3.6	2.1
15	1.7	4.1	5.1	32.9	7.2	6.8	11.7	5.3	6.0	8.7	3.7	2.1
16	1.6	3.5	5.0	37.1	7.4	6.2	10.9	5.2	5.3	8.5	3.5	3.1
17	1.6	2.8	5.2	37.9	8.0	5.9	10.0	5.1	4.8	8.4	3.1	4.5
18	1.5	2.5	5.3	35.2	7.9	6.5	9.4	4.8	4.4	8.1	2.9	4.1
19	1.5	2.4	4.8	26.3	7.5	7.5	8.8	5.1	4.4	7.5	2.8	3.5
20	1.5	2.5	4.5	18.7	7.7	8.2	12.3	5.5	4.3	7.2	2.8	3.0
21	1.5	2.3	4.2	19.0	7.9	8.2	16.2	6.1	7.0	6.9	3.0	2.8
22	1.5	2.4	4.0	19.0	8.9	7.8	16.3	6.5	7.8	6.2	2.9	3.0
23	1.5	3.0	3.8	17.4	8.9	7.6	15.5	6.9	7.4	5.6	2.9	2.6
24	1.5	4.6	3.7	14.9	8.7	8.4	14.8	7.1	7.1	5.4	3.0	2.3
25	1.5	6.2	4.1	12.2	7.9	9.0	13.5	7.6	6.9	5.2	2.7	2.3
26	1.5	6.7	4.9	10.5	7.5	9.5	13.7	7.8	6.8	5.0	2.8	3.6
27	1.5	6.3	8.1	9.7	6.7	10.0	13.6	6.7	6.7	4.6	3.2	3.6
28	1.5	5.6	10.2	8.5	6.4	10.6	10.4	6.2	7.3	4.5	3.6	3.1
29	1.4	4.7	9.6	7.7	5.9	10.3	9.1	5.8	7.5	4.3	4.4	2.6
30	1.4	4.0	8.4	6.9	.....	9.7	8.8	5.7	7.2	4.1	3.8	2.4
31	1.4	.....	7.8	6.8	.....	9.4	.....	5.6	.....	3.8	3.3	.....

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Daily gage height, in feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1893.												
1	2.2	1.1	4.1	3.4	10.4	8.4	5.5	10.2	7.4	3.9	2.6	8.4
2	2.0	1.2	4.0	3.4	12.1	9.1	5.3	9.6	8.0	3.8	2.5	6.8
3	1.9	1.2	3.8	4.7	10.6	8.9	5.1	11.0	10.0	4.2	3.1	5.0
4	1.8	1.6	3.7	5.7	8.6	8.9	5.1	18.4	8.1	5.2	3.5	6.2
5	1.7	2.0	3.6	5.6	8.0	8.7	5.1	24.5	6.6	4.8	3.3	6.0
6	1.6	2.3	3.6	5.3	7.7	9.0	5.2	28.2	8.3	3.9	3.2	4.9
7	1.6	2.4	3.3	5.2	7.0	9.1	5.4	30.0	16.0	3.8	4.9	4.3
8	1.5	2.4	3.2	4.7	6.5	8.8	5.4	28.2	20.7	3.5	5.0	3.5
9	1.5	2.9	3.2	4.0	6.1	8.8	5.1	18.0	19.1	3.4	4.1	3.2
10	1.5	4.4	3.0	3.8	6.2	9.4	5.1	12.8	15.2	3.6	3.8	2.8
11	1.5	5.9	2.9	3.4	8.5	11.1	5.1	11.7	11.8	3.4	3.3	2.8
12	1.5	6.6	2.7	2.9	14.7	11.7	5.0	10.4	8.9	3.4	3.0	3.7
13	1.4	7.0	2.6	2.9	21.8	11.5	4.8	9.4	7.3	3.3	2.7	5.8
14	1.4	4.4	2.6	.....	23.6	12.0	10.2	8.8	6.8	3.2	2.5	10 9
15	1.4	4.2	3.3	.....	22.6	10.6	12.1	8.1	6.5	3.0	2.8	12.7
16	1.4	4.8	3.4	.....	21.3	9.5	10.4	7.8	6.2	2.8	2.9	9.6
17	1.4	5.6	5.3	.....	23.6	8.4	8.6	9.4	5.6	2.7	3.8	8.0
18	1.3	6.2	8.1	.....	29.4	7.6	7.4	10.4	5.4	2.8	5.2	7.0
19	1.3	6.4	8.7	.....	32.4	7.0	6.5	8.9	5.3	3.0	4.9	6.1
20	1.2	6.2	8.4	.....	33.4	6.7	6.4	7.7	5.2	3.2	4.0	5.1
21	1.2	5.5	9.1	.....	32.8	6.3	7.2	7.4	5.4	3.5	2.9	4.2
22	1.2	4.8	9.3	.....	28.5	6.0	7.2	6.7	5.6	3.6	2.6	3.6
23	1.2	4.4	8.9	2.9	18.2	5.8	7.1	6.1	5.7	4.6	2.4	3.4
24	1.2	4.2	7.8	3.1	12.3	5.7	6.8	5.7	5.4	5.2	2.3	3.2
25	1.2	3.9	6.7	3.1	10.4	6.4	6.7	5.4	5.9	5.5	2.2	3.0
26	1.1	3.4	5.8	3.4	9.3	6.8	6.0	5.2	5.6	3.7	1.9	2.9
27	1.1	3.1	5.2	3.7	8.4	6.8	5.7	5.0	5.2	3.4	1.8	2.7
28	1.1	3.0	4.8	3.8	8.2	6.3	7.0	4.6	5.1	2.9	1.6	2.6
29	1.1	3.0	4.3	4.4	.....	5.9	9.5	5.4	4.7	2.7	1.6	2.4
30	1.1	3.6	3.9	5.3	.....	5.8	10.4	6.5	4.1	2.6	1.7	2.5
31	1.1	.....	3.3	7.1	.....	5.7	.....	7.4	.....	2.6	1.6	.....
1894.												
1	2.6	3.1	2.5	2.9	5.1	7.7	5.0	3.9	3.8	4.4	2.9	4.0
2	2.5	3.0	3.9	3.4	5.0	8.2	4.8	3.8	3.6	4.0	2.9	3.8
3	2.4	2.8	3.7	3.8	4.9	9.4	5.4	3.7	3.5	3.7	2.9	3.0
4	2.4	2.7	4.1	3.9	5.5	9.7	5.3	3.7	3.4	4.4	2.8	2.6
5	2.6	2.6	4.3	3.5	21.9	9.5	6.8	3.6	3.3	4.2	2.9	2.1
6	2.5	2.5	4.7	3.1	25.5	9.3	6.9	3.5	3.2	3.7	3.0	2.0
7	2.9	2.4	4.7	4.9	23.9	8.5	7.2	3.4	2.9	3.2	2.9	1.8
8	3.1	2.4	4.5	6.1	19.7	8.2	7.4	3.3	2.8	3.3	2.9	1.7
9	2.9	2.3	4.1	9.5	16.1	7.9	6.6	3.4	2.6	3.1	3.0	1.5
10	2.9	2.4	4.0	9.0	16.0	7.2	5.7	3.3	2.5	3.3	2.6	1.4
11	2.6	2.5	3.7	8.5	16.7	6.9	5.9	3.2	2.5	3.7	2.3	1.4
12	2.5	4.8	3.2	7.9	15.4	6.6	7.2	4.7	2.4	3.3	2.1	1.4
13	2.4	3.8	3.1	8.3	15.2	6.7	8.5	5.1	2.3	2.7	1.9	1.3
14	2.5	3.6	3.0	8.0	14.1	7.2	7.8	4.8	2.3	2.4	1.8	1.2
15	2.0	3.5	2.9	7.8	12.2	7.0	7.2	4.3	2.2	2.1	2.0	1.5
16	1.7	3.0	3.0	7.8	10.3	6.9	6.7	4.0	2.1	1.9	3.6	1.8
17	9.6	2.8	3.2	7.1	9.5	6.8	6.3	4.1	2.0	1.8	4.6	1.8
18	6.4	2.7	3.5	7.2	8.6	7.3	5.5	5.2	2.1	2.8	3.5	2.0
19	5.7	2.5	3.8	6.3	8.4	7.4	5.0	5.0	2.4	2.4	3.0	2.0
20	5.2	2.6	3.9	6.0	8.3	7.7	5.1	5.4	2.5	2.4	3.1	1.6
21	4.1	2.6	3.9	5.3	8.5	7.1	4.9	5.6	2.6	3.3	3.6	1.5
22	3.4	2.6	3.5	5.0	8.7	8.8	4.8	6.2	2.5	3.7	3.7	1.5
23	3.1	2.5	3.3	5.0	8.8	8.7	4.7	6.8	2.3	3.8	4.0	1.8
24	2.8	2.5	3.1	5.2	8.2	8.1	4.6	6.9	2.2	3.4	3.6	1.8
25	3.1	2.4	2.9	5.3	7.9	7.7	4.5	7.1	2.2	4.0	3.0	1.6
26	3.3	2.5	2.8	5.2	7.0	7.3	4.3	6.7	2.5	4.1	2.6	1.3
27	4.9	2.6	2.7	5.4	7.7	7.0	4.2	6.0	2.6	3.9	2.2	1.1
28	4.6	2.8	2.6	5.4	7.7	6.5	4.1	5.6	2.7	3.8	2.7	1.0
29	4.0	2.7	2.5	5.1	.....	5.9	4.0	5.1	2.9	3.6	2.4	.9
30	3.5	2.5	2.7	5.0	.....	5.7	4.0	4.7	4.3	3.3	2.7	.8
31	3.2	.....	3.1	4.9	.....	5.2	.....	4.2	.....	3.3	4.3	.....

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Daily gage height, in feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1915—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1895.												
1	0.9	1.4	1.0	4.7	7.6	6.8	7.8	6.0	5.6	3.2	4.4	3.3
2	.9	1.7	1.0	3.9	7.2	7.3	7.4	5.8	5.2	3.4	4.1	3.4
3	1.0	2.3	.9	3.3	7.3	12.1	6.8	5.5	4.8	3.8	3.8	3.2
4	1.5	1.6	.9	3.2	7.5	18.2	6.5	5.4	4.5	4.0	3.5	3.1
5	1.8	1.4	.9	3.1	7.6	19.9	6.3	5.7	4.2	4.5	3.4	2.9
6	1.8	1.5	.9	3.1	7.4	18.2	6.2	6.0	4.4	5.0	3.0	2.8
7	1.5	1.5	.9	3.3	6.9	13.4	6.0	6.5	4.6	5.0	3.2	2.8
8	1.3	1.3	.9	4.0	6.5	10.5	9.6	7.0	5.2	5.1	3.3	2.8
9	1.1	1.2	1.1	10.9	6.4	9.2	10.7	8.2	5.1	5.5	3.3	2.5
10	1.0	1.1	1.2	20.5	5.0	8.6	11.4	8.6	4.6	5.7	3.0	2.4
11	.8	1.0	1.6	28.5	4.0	8.1	13.0	9.0	4.2	5.1	3.0	2.3
12	.9	1.0	3.8	32.1	3.3	7.5	12.5	8.8	3.8	4.4	2.9	2.4
13	1.2	.9	8.6	31.2	4.2	7.8	10.4	8.9	3.6	3.8	3.2	2.5
14	1.9	.8	11.1	28.3	.....	8.0	8.8	9.5	3.5	3.4	2.9	2.5
15	2.4	.8	11.2	19.5	4.3	8.7	7.9	9.0	3.4	3.2	2.8	2.3
16	2.1	.8	10.8	12.3	4.7	9.4	7.4	8.2	3.4	3.2	2.7	2.2
17	1.7	.8	8.6	10.9	4.7	9.2	7.0	7.7	3.8	3.7	3.1	2.1
18	1.4	.7	6.6	10.0	4.2	9.6	9.0	7.1	3.7	3.6	4.3	2.3
19	1.1	.8	4.7	9.7	4.7	9.4	11.8	7.0	3.5	3.3	4.9	2.2
20	1.0	.9	4.2	9.1	4.6	8.9	11.8	7.2	3.2	3.0	5.7	2.0
21	.9	.9	3.6	9.6	5.1	14.3	9.9	7.1	3.1	2.7	5.3	2.1
22	.8	.9	3.2	10.2	5.6	20.6	8.6	6.7	3.2	2.7	6.1	1.9
23	.8	1.0	2.8	9.9	6.1	22.7	7.7	6.2	3.1	2.5	5.3	1.6
24	.8	1.0	2.7	9.1	6.7	22.0	7.1	5.8	3.0	2.4	4.8	1.4
25	.8	1.1	2.5	10.8	6.8	18.2	6.7	5.6	2.9	2.4	4.6	1.3
26	.8	1.2	2.4	10.8	6.5	13.0	6.3	5.6	2.9	2.9	4.7	1.3
27	.7	1.2	4.2	10.0	6.3	11.3	6.0	7.0	2.6	3.8	4.2	1.2
28	.7	1.2	6.9	9.3	6.3	10.6	6.0	7.5	2.5	10.2	3.7	1.1
29	.7	1.1	8.4	8.8	.....	9.5	5.9	7.4	2.5	10.1	3.5	1.0
30	1.0	1.1	7.9	8.6	.....	8.9	5.9	6.7	2.6	7.4	3.7	.9
31	1.1	.....	5.8	8.4	.....	8.4	.....	6.0	.....	5.3	3.4	.....
1896.												
1	.9	1.1	1.4	4.9	4.4	4.1	14.8	3.4	2.6	3.3	5.5	2.4
2	.8	1.2	1.5	5.0	6.2	3.9	27.7	3.4	3.0	3.2	5.2	2.1
3	.8	1.3	1.4	4.9	10.0	3.8	34.4	3.4	4.4	3.1	4.8	1.9
4	.8	1.6	1.4	4.9	11.6	3.7	38.8	3.5	5.7	3.2	4.6	1.8
5	.8	1.6	1.4	4.7	10.5	3.6	40.5	4.0	5.2	3.2	4.5	1.6
6	.8	1.3	1.6	4.3	9.3	3.5	36.9	4.6	4.7	3.2	4.9	1.6
7	.8	1.3	1.5	3.6	11.8	3.4	23.3	4.6	4.1	3.6	5.0	1.5
8	.9	1.2	1.4	3.3	14.0	3.5	11.6	4.3	3.5	5.0	4.2	2.0
9	.8	1.1	1.3	3.2	13.8	3.5	9.0	4.0	3.5	7.9	3.8	2.8
10	.9	1.2	1.3	3.2	13.2	3.4	8.0	3.7	4.5	14.2	3.4	2.7
11	1.0	1.3	1.4	3.1	12.8	3.6	7.2	3.4	7.0	21.1	3.3	2.4
12	1.0	1.7	1.5	3.1	11.4	3.6	6.7	3.1	6.3	21.6	3.4	2.0
13	1.0	2.1	1.8	2.9	10.1	3.8	6.2	2.9	5.1	15.6	3.2	1.8
14	1.0	2.4	1.9	2.7	11.1	3.8	5.8	2.8	4.3	11.5	3.2	1.6
15	.9	2.2	2.0	2.6	12.8	3.7	5.5	2.7	3.6	11.2	3.1	1.6
16	1.0	2.0	1.9	2.4	13.6	3.8	5.2	2.6	3.2	11.4	3.0	1.5
17	1.0	1.9	1.8	2.3	12.5	5.5	5.0	2.5	3.0	11.0	3.0	1.3
18	1.0	1.8	1.7	2.3	11.0	10.1	4.8	2.4	2.8	13.9	2.9	1.4
19	.9	1.7	1.6	2.3	9.0	13.1	4.6	2.4	2.9	12.5	2.7	1.4
20	.9	1.5	1.5	2.3	7.6	15.7	4.4	2.2	3.1	9.6	2.6	1.3
21	.8	1.3	1.6	2.3	6.7	13.8	4.2	2.1	3.7	7.6	2.4	1.2
22	.8	1.1	2.1	2.5	6.0	11.2	4.1	2.1	3.5	6.5	2.4	1.2
23	.7	1.3	3.3	3.1	5.4	9.5	4.1	2.5	3.5	8.5	2.2	1.3
24	.7	1.4	4.2	5.0	4.9	8.4	4.0	3.2	3.3	8.5	2.2	1.4
25	.7	1.3	4.6	6.5	4.7	7.9	4.0	3.6	3.1	8.6	2.8	1.6
26	.7	1.3	4.3	8.2	4.6	7.5	3.8	3.8	2.9	7.8	2.6	2.0
27	.7	1.3	4.2	8.0	4.5	7.2	3.7	3.2	2.6	11.1	2.7	1.7
28	.7	1.3	4.5	7.0	4.4	6.7	3.8	3.1	2.6	12.2	3.2	1.5
29	.7	1.3	5.2	6.0	4.2	6.2	3.8	2.8	2.8	9.3	4.0	1.5
30	.7	1.5	4.7	5.3	.....	5.8	3.6	2.7	3.0	7.2	3.6	2.7
31	1.0	.....	4.7	4.8	.....	7.7	.....	2.5	.....	6.2	2.8	.....

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Daily gage height, in feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1897.												
1	2.5	1.2	11.2	2.4	3.0	12.5	8.7	5.9	4.3	4.9	4.4	2.1
2	2.3	1.2	13.6	2.5	7.0	9.6	12.2	6.3	4.2	4.4	3.8	2.2
3	2.6	1.3	13.9	2.5	10.1	8.6	15.0	7.4	4.2	3.8	3.8	1.8
4	3.0	1.5	11.1	2.6	10.5	9.0	16.0	9.6	4.1	3.4	3.6	1.8
5	2.7	1.5	8.2	2.6	9.4	9.5	26.Q	9.6	4.1	3.6	3.3	1.8
6	2.6	1.6	6.5	2.7	8.3	12.1	30.4	8.5	4.1	4.0	3.4	1.7
7	2.1	2.3	5.6	2.9	8.8	19.2	29.7	7.7	4.0	3.8	4.2	1.7
8	1.7	3.5	4.9	3.0	10.7	25.1	25.4	7.2	4.4	4.0	4.2	1.6
9	1.5	4.2	4.6	2.8	14.1	24.2	20.0	6.6	4.3	4.3	4.8	1.6
10	1.4	4.1	4.4	2.8	15.5	21.3	16.0	6.2	4.1	4.0	5.5	1.4
11	1.2	3.3	4.5	2.7	13.2	22.3	14.1	6.0	5.6	4.2	5.1	1.2
12	1.2	3.2	4.7	2.6	10.8	28.4	12.6	6.2	5.8	4.7	4.4	1.2
13	1.2	5.8	4.4	2.4	9.9	34.0	11.4	7.8	4.9	4.5	4.0	1.2
14	1.2	7.3	4.5	2.6	10.0	37.9	10.3	18.4	4.2	4.1	3.4	1.0
15	1.5	6.5	4.4	4.1	10.5	37.9	9.7	22.4	3.8	3.8	3.0	1.0
16	1.7	5.5	4.1	6.5	10.7	37.0	9.8	20.3	3.6	3.7	2.8	1.0
17	1.6	4.9	3.9	6.6	9.8	36.0	10.2	16.5	3.6	4.8	2.8	.9
18	1.6	4.3	3.8	6.3	8.6	33.8	9.8	11.9	3.6	6.5	3.2	.9
19	1.7	3.8	4.2	6.4	7.6	29.6	9.3	9.1	3.3	5.8	3.3	.8
20	1.6	3.4	4.8	6.8	7.0	29.6	8.8	7.7	3.4	5.9	3.0	.8
21	1.6	3.0	4.6	7.0	7.0	32.4	8.1	6.9	4.5	6.6	3.0	.9
22	1.4	2.8	4.3	7.2	8.3	33.3	7.5	6.4	4.9	6.0	3.4	.8
23	1.2	2.5	4.0	7.3	13.2	30.9	7.0	5.9	5.0	5.8	3.4	.8
24	1.2	2.4	3.8	7.0	25.2	25.0	6.7	5.6	5.3	6.4	3.8	.9
25	1.2	2.3	3.6	6.6	31.6	18.1	6.4	5.6	5.7	8.6	3.2	.8
26	1.2	2.2	3.3	5.9	34.8	14.2	6.2	5.0	6.1	11.2	2.8	.8
27	1.2	2.1	3.1	5.3	33.8	12.2	6.0	4.8	5.2	12.2	2.8	.7
28	1.2	2.2	2.9	4.8	23.6	10.8	6.1	4.6	6.0	8.2	2.8	.7
29	1.1	5.3	2.7	4.4	.....	9.8	6.2	4.4	6.0	6.4	2.4	.7
30	1.1	9.4	2.6	3.7	.....	9.1	5.8	4.2	6.1	5.5	2.2	.8
31	1.3	.....	2.5	3.0	.....	8.6	.....	4.3	.....	4.8	2.1	.....
1898.												
1	.8	.8	1.0	3.4	7.6	3.3	17.4	6.4	3.4	2.4	8.2	3.6
2	.8	.9	1.3	3.2	6.7	3.2	17.8	5.8	3.3	2.4	7.6	4.0
3	.7	1.1	1.4	3.0	6.2	3.0	15.0	5.4	3.3	2.2	6.4	9.2
4	.6	1.2	2.2	2.9	5.4	3.0	11.4	5.0	3.3	2.0	5.4	18.5
5	.5	1.2	3.5	2.8	5.0	3.3	10.4	4.7	2.8	2.4	6.2	25.0
6	.5	1.2	3.8	2.6	4.6	3.4	12.2	4.4	2.6	2.1	11.8	22.2
7	.4	1.3	3.9	2.7	4.4	3.5	11.6	4.4	2.4	2.1	14.6	15.7
8	.4	1.3	3.4	2.8	4.4	3.4	10.3	4.1	2.2	2.2	12.6	11.2
9	.4	1.2	2.8	3.0	4.3	3.2	9.3	4.2	2.0	2.6	10.2	9.5
10	.4	1.2	2.4	3.2	4.2	3.0	8.3	4.2	2.0	3.0	8.5	8.6
11	.5	1.1	2.4	3.2	4.0	2.9	8.6	4.4	1.8	3.5	9.0	7.4
12	.6	1.0	2.0	5.5	3.9	2.8	9.5	4.6	2.0	3.4	12.3	6.4
13	1.0	1.0	1.8	13.2	3.8	2.8	9.4	4.4	1.8	3.2	14.8	5.7
14	1.4	.9	1.8	14.4	3.8	2.8	9.0	4.2	1.8	2.8	15.8	5.2
15	1.2	.8	2.6	12.2	3.8	3.2	9.0	4.0	1.6	2.8	15.0	4.8
16	1.2	.8	2.7	12.2	3.7	5.1	9.2	3.9	1.8	3.5	11.6	4.4
17	1.2	.8	2.4	12.4	3.6	5.0	8.6	3.8	2.0	4.6	8.9	4.2
18	1.2	.8	2.6	10.0	3.5	5.2	8.2	3.7	2.4	5.4	7.1	4.0
19	1.2	.8	2.7	9.2	3.3	5.5	8.0	3.7	3.5	4.6	6.4	3.8
20	1.6	.8	3.6	11.7	3.3	6.1	8.0	3.6	4.0	4.2	6.0	3.6
21	2.0	.7	4.9	13.8	3.2	5.7	7.4	3.6	5.4	4.0	4.0	3.4
22	1.8	.7	8.0	13.4	3.2	5.4	7.0	3.6	5.6	3.3	5.6	3.6
23	1.5	.7	10.2	12.6	3.4	5.2	6.6	3.5	5.0	3.3	5.4	5.0
24	1.4	.7	8.8	12.4	3.5	4.6	6.8	3.4	4.6	3.4	4.8	5.0
25	1.6	.7	7.6	12.4	3.6	4.3	6.6	3.4	3.7	3.6	4.3	6.4
26	1.4	.7	6.3	16.0	3.8	4.2	6.6	3.7	3.4	3.6	4.0	7.2
27	1.2	.7	5.5	18.2	3.5	4.4	6.4	5.0	2.9	4.6	4.0	6.2
28	1.0	.7	4.9	16.7	3.4	4.4	7.1	5.6	2.8	5.6	4.1	5.0
29	1.0	.7	4.4	14.2	.....	4.6	7.0	4.9	2.8	5.4	4.3	4.3
30	.8	.7	4.0	11.2	.....	5.6	6.8	4.2	2.6	5.9	4.1	3.8
31	.8	.....	3.8	9.0	.....	13.2	.....	3.7	.....	7.9	3.8	.....

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Daily gage height, in feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1899.												
1	3.6	4.6	5.1	4.8	5.7	19.2	22.8	7.6	4.2	3.4	4.2	2.2
2	3.3	4.3	5.0	5.0	5.6	17.6	19.5	7.1	4.2	3.3	3.6	2.4
3	3.2	4.2	4.9	5.3	5.6	15.2	14.9	6.7	4.4	3.0	3.0	2.8
4	3.9	4.0	5.0	5.8	10.7	14.2	13.0	6.3	4.8	2.8	2.8	3.0
5	8.9	3.9	5.0	6.0	23.1	18.0	13.2	6.2	4.6	2.6	2.4	2.6
6	16.9	3.9	5.6	7.2	30.4	24.5	14.7	7.1	4.2	2.6	2.4	2.2
7	16.5	4.2	6.0	18.8	34.3	26.6	15.7	8.5	4.0	2.6	2.4	2.0
8	10.8	4.4	5.9	18.4	37.0	27.6	18.0	9.4	3.8	3.0	2.4	1.8
9	8.8	4.5	5.8	17.4	38.2	27.7	17.8	10.0	3.6	2.9	2.2	1.6
10	8.4	4.4	5.6	17.2	36.8	16.2	15.7	10.7	3.4	2.6	2.1	1.8
11	7.6	4.6	5.1	13.8	30.3	11.8	14.2	11.2	3.9	2.6	2.1	1.7
12	6.6	5.0	4.8	10.5	19.4	10.6	12.9	10.4	4.3	2.4	2.0	2.0
13	6.0	5.3	4.6	9.2	12.2	9.6	11.6	9.6	5.2	2.3	2.0	1.8
14	5.7	5.0	4.3	8.1	9.5	11.2	10.7	9.3	5.8	2.2	2.2	2.0
15	5.4	4.6	4.0	7.6	8.5	24.6	10.0	9.6	6.4	2.2	2.6	1.8
16	4.9	4.4	3.8	7.3	7.6	34.2	9.4	9.2	6.1	2.0	2.6	1.6
17	4.7	4.6	3.7	7.4	8.0	36.9	8.8	8.7	6.4	1.9	2.4	1.4
18	5.2	4.8	3.6	7.4	9.6	36.2	8.4	7.8	6.2	1.8	2.3	1.4
19	6.7	5.0	3.8	7.2	11.3	35.8	8.0	6.9	5.2	1.9	2.2	1.2
20	7.8	5.3	5.2	7.0	12.6	37.0	7.6	6.4	4.7	2.0	1.9	1.0
21	9.3	5.8	5.8	6.8	11.5	39.2	7.4	5.9	4.2	2.0	1.7	1.0
22	8.8	6.0	6.0	6.4	10.6	40.0	7.0	5.6	3.8	2.4	1.6	1.0
23	7.6	6.6	5.8	6.0	10.1	38.7	7.8	5.4	3.5	2.7	1.4	1.3
24	7.2	6.8	5.4	5.6	9.8	32.7	9.6	5.3	3.2	3.5	1.3	1.5
25	7.2	6.6	5.2	6.0	9.5	23.2	9.4	5.0	3.2	3.4	1.2	1.5
26	7.6	6.1	5.4	6.4	9.2	16.3	10.8	4.8	3.0	3.0	1.2	1.4
27	6.9	5.6	5.9	5.8	13.2	13.6	10.3	4.6	3.2	3.0	1.2	1.3
28	6.2	5.2	5.7	5.8	18.4	14.0	9.2	4.4	3.6	3.6	1.2	1.2
29	5.6	4.8	5.2	5.6	.....	17.3	8.4	4.3	3.5	4.2	1.5	1.2
30	5.2	5.0	4.8	5.3	.....	21.2	7.8	4.2	3.3	4.2	1.8	1.3
31	4.8	.....	4.5	5.3	.....	22.8	.....	4.2	.....	5.2	1.8	.....
1900.												
1	1.2	1.1	1.7	3.0	3.2	8.0	7.8	6.2	2.8	8.8	6.2	2.1
2	1.1	1.1	1.7	.....	3.0	8.7	7.2	5.6	2.8	8.2	5.4	2.0
3	1.0	1.0	1.7	.....	2.6	10.9	6.8	5.4	3.0	7.0	4.7	2.3
4	1.0	1.1	1.7	.....	2.5	12.5	7.2	5.2	3.2	6.3	4.2	2.5
5	.9	1.5	1.8	.....	2.9	12.8	8.0	5.0	3.2	5.8	3.6	2.3
6	.8	1.5	1.7	2.1	3.5	10.6	8.6	4.8	3.5	5.4	3.2	2.0
7	.8	1.5	1.6	2.2	4.0	10.0	7.8	4.6	5.6	5.0	2.9	1.7
8	1.0	1.4	1.5	2.3	3.9	11.6	7.0	4.4	6.6	4.5	2.6	1.6
9	1.2	1.4	1.4	2.4	5.4	14.6	6.5	4.4	6.2	4.2	2.4	1.4
10	1.6	1.2	1.4	2.4	8.4	16.5	6.1	4.4	5.3	4.2	2.3	1.3
11	1.8	1.2	1.6	3.4	9.4	16.2	6.5	4.3	5.0	4.3	2.1	1.2
12	1.8	1.1	5.2	6.0	9.0	14.2	7.5	4.3	4.9	3.8	2.0	1.1
13	1.7	1.0	6.4	8.2	13.9	11.6	7.4	4.2	4.5	3.4	1.9	1.0
14	1.6	1.0	7.4	8.7	21.6	9.8	7.0	4.0	5.2	3.3	1.9	1.1
15	1.4	1.0	7.2	8.4	24.0	8.6	6.5	3.8	5.3	3.3	2.1	1.8
16	1.2	1.0	6.2	7.8	21.4	8.0	6.3	3.8	5.2	3.3	2.2	3.1
17	1.2	1.0	5.2	6.4	17.0	7.8	8.8	3.6	5.4	3.2	2.3	4.0
18	1.2	1.0	4.2	5.5	12.0	7.6	10.6	3.5	6.2	3.1	2.3	4.1
19	1.1	1.0	3.8	5.8	9.2	7.6	9.8	3.4	8.8	3.0	2.3	4.6
20	1.1	1.0	4.2	8.5	7.7	8.6	9.4	3.4	9.2	2.9	2.2	4.7
21	1.1	.8	4.4	9.4	7.1	11.6	11.7	3.2	8.9	2.7	1.9	3.9
22	1.1	.8	4.4	8.8	7.7	15.0	12.0	3.2	7.6	2.5	1.8	3.0
23	1.0	1.0	4.2	8.0	8.5	17.4	11.4	3.0	6.4	2.5	1.7	2.6
24	1.0	1.2	5.6	7.2	8.6	16.4	10.7	3.0	6.2	2.8	1.8	2.4
25	1.0	1.3	6.2	6.2	8.6	12.6	9.8	3.2	7.2	3.0	1.9	2.7
26	.8	1.7	6.3	5.5	9.5	11.2	8.5	3.2	7.6	3.1	2.5	2.7
27	.8	1.8	5.8	5.0	9.3	10.9	7.8	3.4	8.0	3.3	3.1	2.6
28	.8	1.8	5.6	4.6	8.4	10.7	7.4	3.6	8.2	4.6	2.7	2.4
29	.9	1.8	5.1	4.2	.....	10.2	7.0	3.6	8.6	8.0	2.5	2.3
30	1.0	1.8	4.6	3.9	.....	9.4	6.6	3.4	8.7	8.2	2.3	2.2
31	1.0	.....	3.8	3.6	.....	8.5	.....	3.0	.....	7.3	2.2	.....

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Daily gage height, in feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1901.												
1	2.0	2.9	8.7	5.2	6.5	3.7	12.4	10.8	12.0	6.0	2.8	9.9
2	1.8	2.6	6.5	5.7	6.7	3.7	13.2	9.3	11.1	5.9	2.8	9.8
3	1.7	2.5	5.6	5.8	7.2	3.7	19.7	8.5	9.8	6.3	2.9	9.7
4	1.5	2.9	5.1	5.6	8.7	3.7	24.1	7.6	8.5	6.4	2.8	10.2
5	1.4	3.3	5.6	5.1	10.1	3.8	23.9	7.0	7.7	6.0	2.6	9.4
6	1.3	3.7	6.9	4.7	10.0	4.0	22.4	6.7	6.9	5.2	2.6	7.9
7	1.3	4.2	8.3	4.4	9.4	4.1	18.9	6.4	6.9	5.1	3.2	6.9
8	1.6	4.2	9.2	4.1	8.9	4.1	14.2	6.2	6.9	5.4	9.1	6.4
9	1.8	3.7	8.5	3.9	8.5	4.0	11.8	5.9	6.5	5.6	12.2	5.9
10	2.1	3.2	7.0	3.8	7.7	7.0	10.3	5.6	6.9	6.3	9.9	5.5
11	2.1	3.0	6.1	6.1	7.6	9.8	9.2	5.6	8.2	6.6	7.3	5.3
12	2.5	2.7	5.4	15.4	7.0	11.2	8.4	5.4	7.4	5.6	5.8	5.1
13	3.0	2.5	5.9	26.6	7.1	9.7	7.9	5.6	6.4	5.0	5.3	5.7
14	2.5	2.3	4.5	28.1	7.2	8.2	6.8	5.5	6.1	4.4	6.5	5.9
15	1.9	2.2	4.3	25.3	7.0	7.3	9.8	5.5	6.4	4.1	14.0	6.0
16	1.8	2.1	4.2	19.5	6.4	6.4	10.3	5.4	7.5	3.6	27.3	6.1
17	1.6	2.0	4.0	12.7	5.8	5.8	10.2	5.2	8.9	3.7	32.8	6.3
18	1.5	2.0	3.6	9.7	5.3	5.4	9.6	4.9	9.8	3.9	32.6	6.8
19	1.4	1.9	3.4	8.1	5.1	5.0	10.8	5.3	9.3	3.7	28.6	9.9
20	1.3	1.9	3.3	7.2	5.0	4.7	21.1	8.0	8.9	3.7	23.4	9.3
21	1.2	2.1	3.3	6.4	4.9	4.7	26.5	10.2	8.4	4.2	18.6	8.3
22	1.2	2.2	4.0	5.9	4.7	4.8	24.7	20.2	7.7	3.9	17.0	7.4
23	1.4	2.3	4.2	5.4	4.5	5.2	23.0	26.5	10.1	3.7	16.5	6.4
24	2.2	2.8	4.7	5.6	4.4	5.0	22.2	29.7	9.5	3.5	18.5	5.6
25	4.1	3.2	5.2	5.8	4.2	5.0	19.0	32.4	7.6	3.1	16.5	5.2
26	7.0	7.8	5.4	5.8	4.1	7.7	17.1	32.5	9.6	3.0	13.1	4.9
27	7.5	13.9	5.2	5.4	3.8	15.9	14.9	23.5	9.8	2.9	11.0	4.6
28	6.0	15.6	4.6	5.2	3.7	22.3	14.9	13.5	8.4	2.9	10.3	4.4
29	4.9	15.6	4.3	5.2	.....	21.7	14.5	12.1	7.2	2.8	10.7	4.4
30	3.7	13.2	4.2	5.2	.....	18.4	13.8	11.9	6.4	2.8	10.0	4.3
31	3.4	.....	4.5	5.5	.....	14.7	.....	12.3	.....	2.8	9.8	.....
1902.												
1	4.2	2.6	2.3	40.1	20.1	24.0	30.9	5.6	4.0	9.8	2.2	1.4
2	4.5	2.6	2.2	40.8	21.8	31.9	27.0	8.5	3.8	10.2	2.0	1.2
3	4.6	2.5	2.3	37.6	23.2	35.8	18.0	9.3	3.6	8.8	2.1	1.2
4	4.5	2.5	2.5	26.8	21.7	38.0	12.3	8.0	3.5	7.5	2.4	1.5
5	4.4	2.5	2.5	15.0	18.0	35.9	10.7	6.8	3.4	6.5	2.4	1.3
6	4.8	2.5	2.5	10.9	14.5	30.3	10.0	6.0	3.4	5.5	2.8	1.4
7	4.5	2.4	3.0	9.7	11.7	25.5	9.5	5.6	3.2	4.5	2.5	1.5
8	4.1	2.4	3.2	8.9	10.0	20.7	9.8	5.6	3.2	4.0	2.1	1.5
9	3.9	2.4	3.2	8.0	8.8	17.9	9.9	5.5	3.3	3.7	1.9	1.8
10	3.7	2.4	3.5	7.7	8.1	15.6	9.5	5.2	3.4	3.5	2.2	1.5
11	3.4	2.4	3.5	7.3	7.5	14.2	8.9	5.0	3.2	3.4	2.8	1.4
12	3.4	2.4	4.0	6.9	6.9	12.9	8.4	4.8	3.4	3.4	2.7	1.5
13	3.5	2.5	4.1	6.5	6.4	12.1	8.0	4.6	3.5	3.6	2.4	1.9
14	4.0	2.5	4.7	6.2	6.0	11.2	7.5	4.5	3.3	4.8	2.0	2.1
15	4.3	2.5	17.9	5.8	6.0	10.5	7.3	4.5	3.1	5.0	1.7	2.0
16	4.1	2.5	26.8	5.5	6.1	10.0	7.1	4.6	3.0	4.2	1.6	1.9
17	4.1	2.4	28.6	5.3	6.0	12.2	6.9	4.7	3.0	3.8	1.5	1.8
18	4.0	2.4	26.7	5.1	5.8	14.5	6.8	4.5	3.0	3.3	1.5	1.5
19	3.7	2.3	19.9	5.1	5.6	14.9	6.7	4.5	4.0	3.1	1.5	1.4
20	3.3	2.3	11.4	5.2	5.5	14.1	6.6	4.4	4.5	2.9	1.4	1.4
21	3.1	2.2	8.3	5.4	5.2	12.3	6.5	4.4	4.6	2.6	1.5	1.4
22	3.1	2.1	6.6	6.2	5.7	10.6	6.3	4.5	4.4	2.7	1.6	2.0
23	3.1	2.2	5.7	6.5	6.8	9.5	6.1	4.8	4.0	2.9	1.6	2.6
24	3.0	2.5	5.8	6.7	7.9	8.9	6.0	4.6	3.9	2.6	1.5	2.6
25	3.0	2.5	6.9	6.6	8.1	8.3	5.9	4.6	3.7	2.3	1.4	2.8
26	2.9	2.5	7.9	6.1	8.5	7.8	5.7	4.5	3.5	2.0	1.4	3.3
27	2.8	2.6	10.2	6.3	8.6	7.5	5.5	4.2	4.0	2.0	1.5	3.6
28	2.7	2.5	16.0	8.5	13.3	7.2	5.4	4.0	3.9	1.9	1.5	3.6
29	2.6	2.5	24.0	12.6	.....	12.9	5.2	4.4	4.0	1.9	1.6	3.6
30	2.5	2.4	32.0	15.8	.....	26.5	5.2	4.5	5.0	2.0	1.9	3.5
31	2.5	.....	37.4	18.9	.....	30.8	.....	4.3	.....	2.3	1.7	.....

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Daily gage height, in feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1903.												
1	3.9	1.3	5.2	4.7	4.8	26.5	17.4	9.0	6.5	4.1	2.8	1.
2	3.7	1.3	5.1	4.5	4.9	31.0	16.6	8.3	8.2	3.8	2.6	1.
3	3.9	1.4	6.7	5.3	5.1	29.2	14.8	7.8	11.6	3.7	2.9	1.
4	3.3	1.5	7.4	6.1	7.6	23.6	13.0	7.3	11.5	3.6	3.8	1.
5	3.0	1.5	7.8	6.9	15.4	16.5	12.3	7.0	10.1	3.6	3.8	1.
6	2.8	1.5	7.5	6.8	19.6	13.1	12.4	6.7	9.3	3.8	4.2	1.
7	2.4	1.4	7.5	8.2	17.5	12.3	11.9	6.6	9.8	3.9	4.9	1.
8	2.1	1.8	6.6	7.6	18.0	14.6	15.5	6.3	11.2	3.8	4.2	1.
9	2.0	2.2	6.0	6.7	17.2	20.7	24.5	6.0	10.5	4.0	3.6	1.
10	1.9	2.1	5.3	6.0	15.3	24.2	30.3	5.8	9.0	4.0	3.0	1.
11	2.2	1.9	4.7	5.5	14.4	23.9	31.8	5.6	8.7	3.9	2.6	1.
12	2.9	1.8	4.2	6.2	16.0	21.0	28.0	5.4	7.8	3.8	2.7	1.
13	2.7	1.8	3.9	7.1	16.3	18.3	19.7	5.2	8.0	4.1	3.3	1.
14	2.7	1.6	3.6	7.2	14.8	16.2	17.5	5.0	7.1	5.7	2.9	1.
15	3.3	1.5	3.4	6.5	13.6	14.9	20.4	4.9	6.3	5.5	3.2	1.
16	3.4	1.4	3.5	6.0	12.3	13.6	21.9	4.8	5.6	5.4	3.8	1.
17	3.5	1.4	4.8	5.8	18.4	11.9	21.2	4.7	5.1	5.6	4.1	1.
18	3.0	1.4	7.4	5.4	25.9	10.7	18.8	4.6	4.7	5.1	3.8	1.
19	2.8	1.7	7.8	5.1	29.3	9.8	16.1	4.5	4.4	4.7	3.4	1.
20	2.6	1.9	7.2	4.8	29.0	9.0	14.2	4.3	4.3	4.1	3.8	1.
21	2.2	2.1	7.0	4.5	24.4	9.0	13.2	4.2	4.3	3.8	3.3	1.
22	2.0	1.9	8.7	4.4	15.4	9.0	13.0	4.1	4.3	4.0	3.0	1.
23	1.8	1.9	9.6	4.2	11.3	10.0	13.0	4.0	4.3	3.6	2.9	1.
24	1.8	2.0	8.7	4.0	9.9	16.7	11.8	4.0	4.3	3.2	2.5	1.
25	1.6	2.1	7.2	4.0	8.8	25.8	10.8	3.8	4.2	2.9	2.2	1.
26	1.5	3.5	6.5	4.2	8.0	28.8	10.1	3.8	4.1	2.7	2.0	1.
27	1.4	6.1	5.7	4.3	7.5	27.3	9.6	3.6	4.1	2.6	1.8	.
28	1.4	6.3	5.1	4.4	12.7	20.1	9.2	3.5	4.5	2.4	1.7	.
29	1.3	5.8	4.5	4.5	.....	13.8	9.2	3.5	4.7	2.3	1.6	.
30	1.2	5.4	4.3	4.7	.....	13.1	9.6	3.8	4.5	2.3	1.6	.
31	1.2	.....	4.6	4.8	.....	16.0	.....	4.7	.....	2.2	1.8	.....
1904.												
1	.6	.8	1.1	3.1	3.4	8.1	9.0	6.0	4.3	3.6	2.2	2.
2	.6	.9	1.1	2.6	3.1	7.4	8.1	7.6	4.1	3.7	2.2	2.
3	.6	1.1	1.1	2.3	2.8	7.0	7.2	6.7	4.3	4.3	2.6	1.
4	.6	1.2	1.0	2.2	2.7	6.6	6.6	5.8	4.4	4.0	2.4	1.
5	.6	1.8	1.0	2.0	2.5	6.1	6.0	5.4	4.9	3.9	2.6	1.
6	.6	1.8	.9	2.0	2.4	6.2	5.6	5.2	4.9	3.4	2.9	1.
7	.6	1.5	1.0	1.7	2.3	6.1	5.4	4.9	4.5	3.1	3.7	2.
8	.8	1.4	.9	1.6	3.6	8.0	5.4	5.4	3.8	2.9	3.7	2.
9	1.0	1.3	1.0	1.5	4.8	11.0	5.8	5.6	3.7	2.7	3.3	2.
10	1.5	1.3	.9	1.6	5.9	11.3	5.9	6.4	3.7	2.9	3.3	2.
11	1.4	1.3	.9	1.7	5.4	11.1	6.0	7.0	3.4	2.9	3.3	1.
12	1.3	1.3	.9	1.7	5.8	10.1	5.6	7.2	3.2	3.1	3.3	1.
13	1.2	1.3	1.0	1.9	4.9	9.0	5.3	6.6	2.8	3.1	4.1	1.
14	1.2	1.3	.9	2.1	4.4	8.5	4.9	5.7	2.6	3.6	3.7	1.
15	1.0	1.2	.9	2.3	3.9	9.1	4.7	5.4	2.5	3.4	3.3	1.
16	.9	1.2	1.0	2.5	3.6	8.9	4.4	5.2	2.5	3.0	3.3	1.
17	1.0	1.5	1.2	2.6	3.5	8.1	4.3	4.9	2.4	2.6	4.1	1.
18	1.0	1.6	1.1	2.9	3.3	7.1	4.3	4.5	2.2	2.4	3.9	1.
19	1.0	5.6	1.0	3.9	3.1	6.6	4.3	4.3	2.1	2.2	3.1	.
20	.9	5.8	1.4	3.8	3.2	6.1	4.2	4.1	2.0	2.1	2.7	.
21	.9	4.6	3.0	3.6	3.7	5.8	4.1	3.8	2.0	1.8	2.4	.
22	.9	3.8	4.7	3.6	5.2	7.4	4.0	3.6	2.1	1.7	2.4	.
23	.9	3.1	4.4	6.0	6.3	12.9	4.0	3.5	2.6	1.9	2.2	.
24	.8	2.5	3.7	10.6	7.9	18.2	4.0	3.4	2.7	2.2	2.2	.
25	.8	2.1	3.7	9.2	8.1	21.8	4.0	3.1	2.3	2.1	2.9	.
26	.7	1.8	3.4	7.5	7.9	20.9	3.8	2.9	2.3	2.0	3.0	.
27	.7	1.6	3.1	7.1	7.1	19.1	3.7	2.8	2.2	2.2	2.8	.
28	.6	1.5	3.7	5.8	7.3	16.9	4.1	2.7	2.2	2.4	2.6	.
29	.6	1.3	3.8	4.8	9.0	14.0	4.6	2.7	2.7	2.1	2.6	.
30	.6	1.2	3.8	4.2	.....	11.8	4.7	2.6	3.4	2.6	2.5	.
31	.7	.....	3.7	3.8	.....	10.3	.....	3.0	.....	2.9	2.3	.....

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Daily gage height, in feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1915—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1905.												
1	0.7	0.1	1.1	6.7	2.8	8.6	4.8	8.6	5.9	8.6	3.8	3.4
2	.7	.1	1.4	5.4	3.2	7.9	4.8	8.0	5.4	6.3	3.8	3.3
3	.6	.2	1.7	5.4	3.2	7.3	4.5	6.9	4.8	5.2	4.3	3.5
4	.5	.4	2.2	4.0	3.1	6.8	4.4	6.2	4.3	4.4	3.9	3.3
5	.4	.5	2.1	4.2	3.0	6.4	4.3	5.7	4.1	4.2	3.3	3.5
6	.5	.5	3.5	4.5	3.8	6.1	4.4	5.3	3.8	4.1	3.0	3.5
7	.4	.6	4.4	4.3	5.1	5.9	4.5	5.1	3.7	3.9	3.0	3.3
8	.3	.6	5.8	4.6	6.4	5.6	5.0	5.5	3.5	4.0	2.8	3.3
9	.2	.6	5.7	4.8	12.1	5.9	4.9	6.5	3.4	4.5	3.2	3.2
10	.3	.9	5.4	5.2	20.4	10.6	6.2	7.9	3.4	4.6	3.5	3.0
11	.3	.9	4.2	5.0	22.4	16.2	6.3	8.0	3.1	4.5	5.1	2.7
12	.3	.9	3.5	5.1	20.2	17.3	6.7	7.2	3.0	5.2	6.5	2.5
13	.3	.8	3.0	9.6	16.0	15.4	7.0	6.3	2.9	6.6	7.2	2.8
14	.2	.6	2.7	17.2	13.6	13.4	7.3	5.8	3.0	10.5	8.4	2.7
15	.2	.6	2.5	16.4	13.3	10.6	7.8	5.8	3.1	12.7	8.9	2.5
16	.2	.7	2.4	15.1	12.2	8.8	7.4	7.2	3.2	11.3	8.8	2.4
17	.2	.8	2.3	11.3	11.2	7.7	6.7	10.9	3.3	9.2	7.6	2.4
18	.2	.9	2.1	8.1	9.4	6.9	6.0	13.7	3.3	7.3	7.0	2.3
19	.2	1.0	2.0	6.6	8.3	6.4	5.5	13.5	3.1	6.2	6.4	2.2
20	.2	1.1	1.8	5.8	7.9	6.0	5.1	11.8	4.3	5.5	6.1	2.0
21	.1	1.0	1.7	5.3	14.9	6.5	4.7	9.6	4.9	5.1	5.8	2.0
22	.1	1.0	1.6	5.0	21.4	7.0	4.7	7.8	5.0	5.4	5.1	1.9
23	.1	.9	1.5	4.7	21.0	7.5	4.7	7.4	6.0	5.1	4.6	1.8
24	.1	1.0	1.4	4.4	19.4	7.0	4.7	9.5	5.9	4.7	4.2	1.7
25	.1	1.0	1.4	4.0	15.6	6.4	4.5	10.2	5.7	4.8	5.8	1.7
26	.1	1.0	2.0	3.7	13.1	6.1	4.4	8.8	5.1	5.0	7.0	1.6
27	.1	1.1	3.0	3.4	11.2	5.7	5.3	7.6	4.5	5.4	6.0	1.6
28	.1	1.0	7.3	2.9	9.7	5.4	6.2	6.8	4.4	4.8	5.4	1.5
29	.1	1.0	10.2	2.4	.....	5.2	6.4	6.1	6.0	4.2	5.0	1.4
30	.1	1.0	9.6	2.4	.....	5.1	7.6	5.8	5.6	3.8	4.5	1.4
31	.1	.....	7.6	2.7	.....	4.9	.....	5.9	.....	3.8	4.0	.....
1906.												
1	1.3	2.6	1.5	5.5	9.6	5.3	14.8	4.9	4.1	4.6	7.7	13.0
2	1.3	2.4	1.6	5.1	9.1	5.2	12.4	4.8	3.8	4.2	9.0	11.7
3	1.4	2.2	2.4	5.0	8.8	5.5	10.6	4.8	4.1	3.9	9.5	10.3
4	1.4	2.0	6.6	8.3	8.3	8.2	9.2	4.9	4.3	3.7	8.2	8.9
5	1.6	1.9	10.5	12.0	7.7	9.4	8.3	5.1	4.3	3.5	7.6	7.7
6	1.7	1.8	9.7	12.9	7.0	8.6	7.5	5.5	4.3	3.5	7.9	7.9
7	1.7	1.7	8.8	12.1	6.5	7.7	7.1	6.0	4.1	3.7	7.3	9.1
8	1.6	1.6	7.1	10.9	6.1	7.2	6.9	7.2	3.9	3.7	6.9	10.4
9	1.5	1.6	6.6	9.1	5.8	6.7	6.9	8.2	3.9	4.4	6.2	10.4
10	1.5	1.6	9.5	8.1	5.6	6.3	7.4	8.9	3.8	5.4	5.8	9.3
11	1.6	1.6	9.7	7.6	5.3	5.9	8.6	8.3	3.6	5.5	5.5	8.2
12	2.6	1.5	9.4	7.0	5.0	5.7	9.3	7.0	3.2	5.2	5.2	8.8
13	3.2	1.5	8.1	6.7	4.8	5.4	8.7	6.1	3.2	4.5	4.9	8.0
14	3.7	1.4	6.8	6.9	4.7	5.1	8.1	5.5	4.4	4.7	4.7	7.0
15	3.0	1.4	6.1	6.9	4.7	5.7	8.4	5.1	5.4	6.7	5.1	6.2
16	3.0	1.3	6.7	7.4	4.6	7.3	8.7	4.8	7.8	8.7	6.3	5.7
17	2.6	1.3	6.6	8.0	4.6	9.9	9.4	4.5	9.2	7.9	7.3	5.2
18	2.3	1.3	6.0	8.9	4.5	10.6	10.1	4.2	8.6	9.3	7.2	4.9
19	2.1	1.2	5.7	8.7	4.5	10.4	10.2	4.0	7.7	14.2	7.6	4.8
20	1.9	1.3	5.4	8.0	4.4	10.7	8.9	3.8	6.8	15.0	7.7	6.1
21	1.8	1.3	6.3	7.5	4.4	10.6	7.7	3.7	6.0	10.8	7.7	8.1
22	1.8	1.4	7.5	7.3	4.9	9.7	7.0	3.6	5.5	10.3	7.3	11.1
23	1.9	1.6	8.1	8.7	5.5	8.9	6.5	3.5	5.1	12.0	6.9	10.3
24	2.0	1.6	9.4	12.4	6.0	8.1	6.9	3.5	4.9	13.7	6.5	9.2
25	1.9	1.5	11.0	17.4	5.8	7.4	5.7	3.4	6.0	12.3	6.5	8.5
26	2.1	1.5	10.4	21.4	5.5	6.9	5.4	3.3	6.6	9.7	7.1	7.7
27	2.9	1.5	9.0	18.9	5.3	6.7	5.2	3.3	6.7	8.1	7.3	7.9
28	3.3	1.5	7.8	13.4	5.2	6.9	5.3	3.7	6.2	7.5	6.7	6.4
29	3.3	1.5	7.0	11.1	.....	7.6	5.6	3.9	5.5	7.2	6.5	5.9
30	3.0	1.5	6.4	10.2	.....	9.6	5.3	4.1	5.0	6.6	7.7	6.1
31	2.9	.....	6.0	10.1	.....	13.7	.....	4.6	.....	7.0	9.7	.....

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Daily gage height, in feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1907.												
1	13.9	4.5	6.3	20.5	5.0	10.4	5.6	7.0	4.5	6.3	5.8	3.0
2	19.2	4.4	6.2	19.6	9.3	12.3	6.3	6.6	5.4	5.8	5.8	2.8
3	19.3	4.3	5.7	15.4	11.2	17.2	7.0	6.2	5.9	5.6	4.5	2.6
4	17.9	4.2	5.6	12.5	10.1	18.4	6.4	6.0	6.1	5.0	4.1	2.6
5	13.8	3.9	5.5	10.7	9.1	16.9	6.1	5.9	7.9	4.6	3.6	2.3
6	13.6	3.9	5.3	9.6	9.5	14.5	5.9	6.7	8.7	4.5	3.5	2.3
7	15.3	3.9	5.3	8.7	9.9	11.2	8.6	7.9	8.4	4.3	3.5	2.4
8	15.4	3.8	5.4	7.9	9.6	9.6	11.2	9.6	7.7	3.9	3.0	2.4
9	13.4	3.7	5.5	7.4	8.7	9.5	9.8	11.8	8.1	3.8	3.0	2.4
10	11.4	3.6	5.3	6.9	7.8	9.5	9.9	12.3	9.8	3.7	2.9	2.5
11	9.9	3.5	5.2	6.6	7.1	10.0	10.0	12.5	13.0	3.6	3.0	2.9
12	8.6	3.5	5.6	6.4	6.6	12.0	9.4	12.2	13.5	3.5	3.5	4.1
13	7.6	3.5	5.6	6.3	6.2	12.3	9.0	10.0	11.4	4.2	4.1	4.6
14	7.0	3.7	5.5	6.0	5.9	11.9	8.1	8.9	9.9	5.6	3.8	4.6
15	6.4	4.0	5.4	5.8	5.6	12.1	7.1	8.2	11.2	7.4	3.5	4.3
16	6.0	4.1	5.3	5.6	5.4	12.6	6.7	8.1	10.3	7.3	3.3	3.6
17	5.7	4.4	5.1	5.4	5.3	12.2	6.5	7.5	15.3	6.3	3.5	3.1
18	5.6	4.4	5.8	5.3	5.0	11.5	6.5	6.9	15.0	6.2	3.6	2.7
19	7.0	8.2	8.5	5.1	4.9	10.6	6.5	6.4	10.4	6.2	3.6	2.6
20	7.1	22.1	9.2	5.1	4.8	9.3	6.9	5.7	8.3	4.9	3.5	2.1
21	6.9	31.6	8.9	5.6	4.7	8.4	7.9	5.5	7.5	4.6	3.4	2.1
22	7.0	33.3	9.3	6.6	4.6	7.7	7.6	5.0	7.1	4.5	4.0	2.1
23	8.9	31.0	8.4	8.0	4.5	7.1	7.4	4.7	6.7	4.2	4.2	3.7
24	8.4	22.0	7.7	7.3	4.4	6.6	8.1	4.6	6.1	3.8	4.1	8.4
25	7.4	13.0	7.3	6.6	4.8	6.1	8.5	4.5	6.1	3.8	4.1	10.2
26	6.6	9.7	6.6	6.1	6.8	5.9	8.5	4.4	6.9	3.7	3.8	10.6
27	6.0	8.6	6.1	5.8	9.2	5.7	8.5	4.4	7.0	3.6	3.9	9.3
28	5.6	7.7	5.8	5.5	10.1	5.5	8.6	4.5	7.0	3.6	3.9	6.8
29	5.2	7.2	5.9	5.3	.....	5.4	8.7	4.5	6.8	3.3	3.6	5.8
30	4.9	6.8	10.1	5.2	.....	5.2	7.6	4.4	7.1	3.4	3.2	5.8
31	4.7	.....	16.3	5.1	.....	5.0	.....	4.4	.....	4.3	3.0	.....
1908.												
1	5.6	2.1	7.0	18.6	6.8	7.4	7.8	10.3	5.4	3.1	3.3	3.8
2	4.8	2.0	5.7	17.9	8.3	7.3	7.3	9.8	5.5	2.9	3.4	3.3
3	4.6	2.2	5.3	15.6	10.2	7.5	7.3	9.6	5.5	2.8	3.4	3.2
4	3.8	2.5	4.8	12.0	9.3	8.4	7.6	9.2	5.3	3.0	3.1	3.0
5	3.5	3.6	4.5	10.7	8.6	9.8	13.4	9.5	5.7	4.5	2.8	2.6
6	3.4	3.7	4.2	13.5	8.3	10.3	14.3	9.6	6.1	5.6	3.2	3.0
7	3.6	3.7	4.0	15.5	9.9	9.5	11.0	10.0	6.1	6.6	4.1	3.7
8	3.9	3.7	3.8	13.7	8.0	8.4	9.0	10.4	6.2	6.9	4.2	4.2
9	3.8	3.2	3.5	12.2	7.5	9.6	8.0	11.2	6.2	6.4	4.7	4.5
10	3.6	2.9	3.5	10.5	8.1	9.8	7.4	11.6	6.0	7.3	5.2	4.9
11	3.3	4.6	3.7	9.5	9.4	8.4	6.9	12.2	5.8	7.3	5.5	4.2
12	3.1	6.3	4.3	9.8	9.4	7.7	6.5	12.0	5.7	6.8	5.0	3.8
13	2.9	8.4	5.0	12.1	9.0	8.4	6.1	7.0	5.6	5.6	4.5	3.3
14	2.9	10.5	5.6	17.8	11.1	10.7	5.8	6.3	5.5	4.6	4.0	2.8
15	2.7	8.1	6.2	20.3	15.7	12.2	5.8	5.9	5.3	4.2	3.6	2.5
16	2.5	6.0	6.6	18.2	21.7	12.8	6.0	5.6	5.3	4.3	3.3	2.3
17	2.2	5.1	6.6	14.2	24.7	9.4	6.3	5.2	5.5	4.5	3.0	2.0
18	2.2	4.5	6.7	12.3	23.7	8.5	6.7	4.9	5.8	4.3	2.9	2.0
19	2.1	4.6	6.4	11.4	20.0	7.9	7.8	4.8	6.1	4.0	2.9	2.0
20	2.1	4.8	5.9	10.2	15.3	7.6	8.2	5.2	6.1	3.7	2.9	1.9
21	2.0	5.3	5.6	9.2	12.0	8.1	7.7	5.6	5.9	3.7	3.4	2.0
22	2.0	6.0	5.2	8.5	10.2	9.8	7.3	6.1	5.7	3.8	4.1	2.0
23	2.0	6.7	5.1	7.7	9.2	11.5	7.0	6.1	5.6	3.5	4.4	2.0
24	2.0	9.4	5.8	7.4	8.4	13.3	6.9	6.0	3.4	3.1	7.3	1.9
25	2.0	12.3	6.5	6.7	7.8	15.9	8.0	5.8	3.4	3.0	7.7	1.8
26	2.0	13.6	7.1	6.1	7.4	16.7	9.8	5.7	3.3	3.0	5.6	1.7
27	2.0	13.3	7.8	5.8	7.5	15.2	11.9	5.5	4.4	2.9	5.6	1.6
28	2.0	12.1	7.7	5.6	7.7	12.9	13.9	5.5	4.4	2.9	5.7	1.6
29	2.0	9.3	7.0	5.6	7.6	10.8	13.8	5.3	4.0	2.8	7.1	1.6
30	2.1	7.7	7.3	6.2	.....	9.3	11.7	5.3	3.7	2.9	6.8	1.5
31	2.2	.....	14.6	6.1	.....	8.4	.....	5.2	.....	3.1	4.9	.....

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Daily gage height, in feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1909.												
1	1.5	6.3	2.3	7.2	6.1	13.3	16.5	14.2	6.9	7.9	6.1	3.1
2	1.4	6.1	2.4	7.9	5.9	11.1	13.2	21.4	6.8	8.2	7.6	3.1
3	1.4	5.0	3.2	7.6	5.7	9.7	11.0	24.8	7.1	8.5	8.4	3.1
4	1.4	4.5	4.8	7.2	5.6	8.8	9.5	24.1	16.2	8.2	8.9	3.1
5	1.4	4.2	5.1	7.2	5.4	8.1	8.6	20.0	23.2	7.6	9.1	2.7
6	1.4	3.4	4.9	8.5	5.6	7.7	8.1	14.5	25.3	6.9	8.8	2.7
7	1.3	3.0	6.1	9.9	6.7	8.3	7.8	11.8	23.5	6.3	7.6	2.6
8	1.3	2.8	10.3	9.9	8.1	10.6	7.9	10.7	17.2	6.8	6.8	2.6
9	1.4	2.7	14.0	9.6	8.0	11.5	8.8	8.7	13.1	11.7	6.2	2.6
10	1.5	2.6	13.1	8.5	9.6	16.0	9.1	8.1	14.6	18.5	5.5	2.9
11	1.7	2.5	11.3	7.8	13.5	20.3	8.4	8.2	13.1	17.3	5.2	3.3
12	2.1	2.4	9.0	7.1	18.0	22.8	7.7	8.9	12.4	12.5	5.0	3.2
13	2.4	2.6	7.5	6.8	17.0	21.5	7.6	10.6	11.6	9.7	4.8	3.3
14	2.4	3.4	7.6	6.6	16.3	23.3	8.1	9.8	10.5	9.4	4.4	3.2
15	2.6	3.5	7.9	6.8	13.5	24.6	8.3	8.4	11.1	12.3	4.8	3.1
16	2.4	3.4	7.6	9.5	14.5	21.7	8.3	7.5	11.7	13.2	4.9	2.9
17	2.2	3.2	6.8	12.4	19.6	17.1	8.1	7.0	11.7	11.9	4.8	2.8
18	2.0	3.0	6.0	14.2	19.9	14.7	7.7	6.6	10.8	10.3	10.5	2.7
19	1.9	2.9	5.4	16.4	16.6	12.6	7.0	6.3	9.8	8.3	13.2	2.9
20	1.9	2.9	5.0	16.1	14.5	11.5	6.2	6.1	9.7	7.1	9.0	3.0
21	1.8	2.8	4.7	12.9	12.6	11.4	6.0	7.2	9.0	6.7	7.0	3.1
22	1.7	2.8	4.6	10.0	12.0	12.2	6.2	10.6	9.2	6.4	5.8	3.0
23	1.5	2.7	7.4	8.3	17.2	12.0	6.8	19.9	8.6	6.1	5.0	3.8
24	1.4	2.7	10.7	7.5	20.2	11.1	8.2	21.4	8.0	5.8	4.8	4.0
25	1.4	2.6	12.1	6.9	21.6	10.4	9.3	15.8	8.5	6.7	4.2	4.8
26	2.2	2.5	11.8	6.4	21.3	11.8	8.7	11.2	9.3	6.1	3.8	5.5
27	3.7	2.5	10.0	6.0	18.9	14.3	8.1	9.3	8.8	5.7	3.6	5.0
28	5.0	2.4	7.9	5.7	16.3	14.7	7.9	8.2	9.5	5.4	3.5	4.6
29	3.8	2.4	7.1	5.6	.....	15.5	8.0	7.6	9.0	5.3	3.3	3.8
30	3.2	2.3	7.2	5.7	.....	17.6	8.1	7.4	8.3	4.7	3.2	3.5
31	3.5	.....	7.6	5.8	.....	18.2	.....	7.1	.....	4.8	3.2	.....
1910.												
1	3.0	2.1	1.8	2.4	5.0	7.8	3.5	6.2	7.5	6.0	7.3	2.9
2	2.8	2.1	1.8	2.3	4.9	10.8	3.4	5.6	6.8	6.3	8.1	2.7
3	2.6	2.1	1.7	2.2	4.7	13.6	3.3	5.2	6.3	6.4	6.8	9.1
4	2.4	2.0	1.7	2.9	4.5	13.2	3.2	4.9	6.2	7.0	5.9	8.7
5	2.2	2.0	1.7	3.0	4.6	11.7	3.2	4.6	5.9	7.0	5.6	7.3
6	2.2	2.0	1.7	3.6	4.8	9.9	3.1	4.4	6.9	6.8	6.2	6.8
7	2.1	2.0	1.9	6.0	5.1	8.6	3.1	4.2	8.5	7.6	6.4	6.2
8	2.0	2.0	3.5	11.6	5.1	7.6	2.9	4.2	9.3	9.3	6.2	6.2
9	2.0	1.9	4.5	11.6	5.0	6.9	2.9	6.9	8.0	11.6	6.5	5.8
10	2.0	1.9	4.6	9.8	4.7	6.5	2.8	8.4	7.4	11.1	5.6	5.3
11	2.1	1.8	4.2	9.0	4.6	6.1	2.8	8.7	7.3	10.6	5.7	5.2
12	2.3	1.8	4.0	7.3	4.5	6.1	2.8	8.7	7.1	10.4	5.4	4.9
13	2.6	1.8	3.7	6.0	4.4	6.1	2.7	8.5	6.9	8.9	4.7	4.9
14	3.0	1.8	4.3	5.3	4.4	5.9	2.7	7.4	7.2	8.1	4.3	4.7
15	4.0	1.8	4.9	4.8	4.4	5.8	2.7	6.7	7.5	8.2	3.9	4.2
16	6.1	1.7	5.4	4.5	4.3	5.7	3.0	6.1	7.4	8.5	3.8	3.8
17	5.6	1.7	5.9	4.4	4.3	5.4	3.8	6.1	7.9	8.9	3.6	3.5
18	4.7	1.7	5.5	4.3	7.3	5.1	6.2	6.2	7.9	8.6	3.5	3.3
19	4.3	1.7	5.0	4.2	12.6	4.9	8.0	7.0	7.8	8.3	3.3	3.0
20	3.7	1.7	4.2	5.1	13.9	4.7	7.5	7.6	7.2	7.5	3.3	2.9
21	3.2	1.7	3.8	6.8	12.9	4.5	6.8	8.3	7.0	6.9	3.2	2.7
22	3.1	1.7	3.6	8.1	11.7	4.4	6.2	9.2	6.7	6.5	3.7	2.6
23	2.8	1.7	3.4	9.6	10.4	4.4	5.7	9.4	6.5	6.1	3.7	2.6
24	2.7	1.7	3.1	9.4	9.9	4.1	5.2	9.1	6.0	5.7	3.4	2.5
25	2.5	1.9	2.8	9.3	9.2	4.1	4.9	11.1	5.9	5.3	3.3	2.4
26	2.4	2.0	3.0	8.2	8.2	4.1	4.9	13.4	5.9	5.2	3.2	2.3
27	2.4	2.1	3.4	7.0	7.2	4.0	4.9	12.7	5.8	5.0	3.1	2.3
28	2.4	2.0	3.4	6.3	6.8	3.8	5.1	11.8	5.6	4.8	3.0	2.4
29	2.3	1.9	3.3	5.8	.....	3.8	6.0	10.7	5.8	4.8	2.9	2.4
30	2.3	1.8	.....	5.4	.....	3.7	6.5	9.2	5.9	5.2	3.1	2.5
31	2.2	.....	.....	5.3	.....	3.6	.....	7.8	.....	5.7	3.1	.....

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Daily gage height, in feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1911.												
1	2.5	1.4	1.7	4.7	6.5	5.4	7.0	6.8	3.4	3.7	2.6	1.6
2	2.6	1.4	1.8	10.7	7.4	5.2	6.3	9.9	3.3	3.1	2.5	1.6
3	2.8	1.4	1.8	20.5	9.7	5.2	5.9	11.7	3.2	2.7	2.5	2.0
4	2.8	1.4	1.8	24.2	8.5	5.2	5.6	11.6	3.2	2.6	2.5	3.1
5	2.6	1.4	2.1	24.9	7.8	5.0	14.6	9.9	3.1	2.6	3.1	2.8
6	2.4	1.4	4.8	22.9	8.7	4.8	25.3	8.4	3.1	2.3	3.5	2.6
7	2.3	1.4	8.4	18.6	9.3	4.7	28.8	7.4	3.1	2.3	3.4	2.9
8	2.3	1.4	10.6	12.9	9.5	4.7	29.8	6.9	3.0	2.3	3.3	2.9
9	2.3	1.4	8.7	9.5	15.4	11.4	29.9	6.5	3.0	2.3	3.2	3.0
10	2.4	1.4	8.0	8.1	21.7	18.2	27.3	6.0	3.0	2.3	3.2	2.8
11	2.9	1.4	6.3	7.2	23.7	20.0	21.1	5.8	3.2	2.3	3.0	2.6
12	3.1	1.3	5.0	6.5	23.9	16.4	17.0	5.6	3.2	2.9	3.0	2.5
13	3.1	1.3	4.2	6.0	20.6	11.3	15.8	5.4	2.9	3.2	2.6	2.5
14	2.9	1.3	3.7	5.6	15.0	9.1	13.8	5.1	2.5	3.2	2.6	2.3
15	2.5	1.3	3.3	5.2	11.4	7.9	12.6	4.8	2.4	3.2	2.4	2.3
16	2.3	1.2	3.0	5.0	9.7	7.2	13.9	4.6	2.3	3.5	2.4	2.2
17	2.1	1.2	2.8	4.7	8.6	6.3	14.7	4.4	2.2	3.4	2.4	2.1
18	2.0	1.2	2.6	4.6	7.7	5.6	14.8	4.4	2.2	3.4	2.4	2.0
19	2.0	1.2	2.5	4.5	7.1	5.2	14.0	4.4	2.2	3.4	2.7	2.0
20	1.9	1.2	2.4	4.5	6.7	4.9	15.6	4.4	2.2	3.3	2.8	2.1
21	1.8	1.2	2.4	4.5	6.7	4.8	15.9	4.3	2.3	2.9	2.7	2.1
22	1.7	1.2	2.4	4.5	6.7	4.9	14.3	4.3	2.3	2.7	2.4	2.0
23	1.7	1.2	2.4	4.3	6.6	4.9	12.2	4.4	2.4	2.8	2.2	2.0
24	1.6	1.2	2.4	4.3	6.4	4.9	10.7	4.9	2.4	2.9	2.0	2.0
25	1.6	1.2	2.4	4.2	6.3	4.9	9.5	4.8	2.4	5.0	1.9	2.0
26	1.6	1.2	2.6	5.1	6.0	4.9	8.7	4.6	2.4	4.8	1.8	2.0
27	1.6	1.2	3.1	6.0	5.8	5.4	8.0	4.2	2.4	4.9	1.7	2.1
28	1.6	1.3	3.3	5.8	5.6	6.7	7.5	4.0	2.4	3.8	1.6	2.9
29	1.6	1.5	3.4	5.4	.....	7.4	7.1	3.8	2.6	3.2	1.6	2.9
30	1.6	1.5	3.4	5.4	.....	7.4	6.8	3.6	3.5	2.8	1.6	2.4
31	1.5	.....	3.7	5.9	.....	7.4	.....	3.5	.....	2.7	1.6	.....
1912.												
1	2.2	2.8	4.2	12.9	14.3	14.4	29.6	25.4	8.6	6.3	4.8	3.3
2	2.0	2.7	4.0	13.5	14.2	12.3	26.1	26.0	7.4	5.8	4.8	3.1
3	2.0	2.5	3.9	12.1	12.6	10.3	26.3	22.3	6.6	5.7	4.8	2.9
4	2.0	2.4	3.7	10.7	10.4	9.1	29.3	16.7	6.0	5.6	5.2	2.8
5	2.0	2.4	3.5	9.4	7.8	8.5	30.2	12.9	5.7	5.9	4.5	2.7
6	2.0	2.3	3.3	8.2	7.3	8.4	29.2	11.5	5.6	6.2	4.3	2.6
7	2.0	2.4	3.1	7.2	6.7	8.4	22.7	10.9	5.6	7.8	4.2	2.6
8	2.1	2.9	3.0	6.4	5.7	9.2	14.9	11.7	5.8	7.8	4.2	2.5
9	2.6	3.4	2.9	6.3	5.5	10.2	12.4	12.0	5.4	7.6	4.2	2.5
10	2.6	3.9	2.8	6.4	5.2	10.9	11.1	11.0	5.3	7.0	4.1	2.4
11	2.6	4.5	2.7	6.9	5.2	12.1	10.3	10.1	5.1	6.7	4.1	2.4
12	2.7	4.8	2.7	6.7	4.9	12.5	9.5	9.5	4.8	7.9	4.1	2.4
13	3.7	5.0	2.7	6.6	4.9	12.7	8.9	8.8	4.5	8.0	4.0	2.3
14	3.9	5.7	2.9	6.3	4.9	12.0	8.4	8.3	3.9	7.7	3.8	2.2
15	3.8	6.0	3.5	5.8	4.8	13.8	7.9	7.8	3.9	6.8	3.6	2.2
16	3.8	5.6	5.3	5.8	5.5	20.0	7.8	7.5	4.3	6.3	3.6	2.1
17	4.0	5.2	6.7	4.8	6.3	23.9	8.4	7.4	4.4	6.0	3.8	2.0
18	5.6	5.0	6.5	4.6	6.4	23.8	9.4	7.3	4.6	5.7	4.1	2.0
19	6.0	5.0	5.4	4.2	6.2	21.7	9.9	7.3	4.8	5.2	4.0	2.2
20	7.0	5.1	4.8	4.4	6.1	17.5	10.0	7.7	4.6	5.2	3.9	2.4
21	7.2	5.1	4.8	4.9	6.4	13.2	9.0	7.7	4.4	5.4	3.9	2.7
22	7.7	5.0	4.8	5.6	10.9	11.1	8.5	7.0	4.0	5.5	4.0	2.7
23	6.4	5.0	6.4	5.6	14.9	9.4	11.7	6.4	3.8	6.0	4.3	3.8
24	5.0	4.8	8.0	5.9	15.6	9.1	15.5	6.0	3.6	6.0	4.4	4.5
25	4.4	4.5	9.8	5.9	15.1	12.8	14.6	5.7	3.8	5.6	5.2	6.1
26	3.9	4.4	10.2	5.4	13.8	15.5	12.1	5.5	4.9	5.5	4.9	5.0
27	3.8	4.3	14.5	5.1	14.5	13.7	10.5	5.4	5.5	5.4	4.5	4.9
28	3.6	4.3	18.5	4.9	17.6	12.8	14.8	5.2	6.2	5.8	4.1	4.9
29	3.3	4.3	18.7	5.1	16.5	20.2	20.3	5.6	6.5	6.0	3.8	4.8
30	3.0	4.3	14.6	8.8	.....	28.5	22.7	7.8	6.8	5.6	3.6	4.4
31	2.9	.....	13.1	13.5	.....	31.3	.....	9.8	.....	5.0	3.4	.....

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Daily gage height, in feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1913.												
1	3.8	1.9	1.6	7.4	15.1	22.4	26.9	5.5	10.1	3.2	2.6	1.6
2	3.4	1.8	1.6	8.2	12.3	21.6	17.1	5.4	9.2	3.1	2.5	1.5
3	3.1	1.8	1.6	8.2	10.7	16.7	12.5	5.3	9.2	3.0	2.5	1.5
4	2.8	1.8	1.7	8.6	10.1	13.0	10.9	5.1	8.6	3.1	2.5	1.5
5	2.6	1.8	3.2	8.2	9.9	10.5	9.9	4.9	8.0	3.1	2.6	1.5
6	2.5	1.8	7.0	7.2	9.9	9.0	9.2	4.8	7.5	3.1	2.6	1.5
7	2.4	1.8	9.6	7.1	9.6	8.1	8.5	4.6	7.4	3.1	2.5	1.4
8	2.3	1.8	10.2	16.0	9.0	7.4	8.0	4.6	7.4	3.1	2.2	1.2
9	2.2	2.0	8.5	17.9	8.1	6.9	7.6	4.6	7.6	3.2	2.1	1.2
10	2.1	2.7	7.0	16.4	7.3	6.6	7.2	4.6	7.5	2.9	2.1	1.2
11	2.0	3.2	5.9	14.5	6.9	7.1	6.9	4.7	8.6	2.7	2.3	1.3
12	1.9	3.4	5.0	12.2	8.0	8.0	6.8	4.7	7.8	2.5	2.7	1.3
13	1.9	3.3	4.5	12.0	10.1	8.6	6.7	4.5	6.9	2.5	2.7	1.3
14	1.9	3.0	4.0	12.0	13.8	14.1	7.0	4.4	6.0	2.8	2.8	1.2
15	1.9	2.7	3.7	11.2	11.8	24.1	7.8	4.2	5.3	2.8	2.6	1.1
16	1.9	2.5	3.5	10.4	10.1	30.0	7.8	4.2	4.9	2.6	2.4	1.0
17	2.2	2.5	3.3	9.2	8.6	31.3	8.3	4.2	4.7	2.4	2.2	1.0
18	2.4	2.3	3.3	8.0	7.8	30.4	8.8	4.2	4.4	2.3	2.2	1.0
19	2.4	2.1	3.3	8.6	7.1	25.4	8.7	4.5	4.3	2.2	2.1	1.0
20	2.4	2.1	3.5	10.3	6.6	17.5	8.3	5.2	4.1	2.0	2.1	1.0
21	2.7	2.1	3.5	10.2	6.6	13.1	7.8	5.7	3.9	1.9	2.1	1.5
22	2.8	2.0	3.4	10.1	6.6	12.9	7.2	5.3	3.9	1.8	2.1	1.6
23	2.7	2.0	3.2	10.6	6.5	12.9	6.7	5.1	3.9	1.7	2.0	1.8
24	2.4	1.9	3.2	11.2	6.3	12.3	6.2	6.9	3.9	1.7	2.0	2.3
25	2.3	1.9	3.4	15.2	6.2	11.2	5.9	12.3	3.8	1.7	2.0	2.3
26	2.2	1.8	3.9	19.9	5.8	10.1	5.7	16.0	3.5	1.7	1.9	2.2
27	2.1	1.8	4.1	20.8	6.1	13.3	5.6	16.0	3.4	2.0	1.9	2.2
28	2.1	1.8	4.1	21.7	13.7	25.4	5.5	13.5	3.4	2.1	1.9	1.9
29	2.0	1.7	4.0	23.2	.....	31.2	5.5	11.4	3.4	2.1	1.9	1.7
30	2.0	1.6	4.0	22.6	.....	33.2	5.5	11.1	3.3	2.5	1.9	1.7
31	1.9	.....	5.2	19.1	.....	32.9	.....	11.5	.....	2.7	1.7	.....

Daily gage height, in feet, of Tennessee River at Chattanooga, Tenn., Oct. 1–21, 1913.

Day.	Oct.	Day.	Oct.	Day.	Oct.	Day.	Oct.
1	1.6	6	1.4	11	0.9	16	0.7
2	1.6	7	1.2	12	.8	17	.7
3	1.6	8	1.1	13	.8	18	.7
4	1.6	9	1.0	14	.8	19	.7
5	1.5	10	.9	15	.7	20	.7
						21	.9

Daily discharge, in second-feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May.	June.	July.	Aug.	Sept.
1874.							1874.						
1	38,200	195,000	21,200	16,300	45,000	89,200	16	147,000	42,300	23,500	17,900	10,600	11,000
2	38,200	190,000	20,700	16,900	36,200	55,200	17	159,000	34,800	21,800	12,800	9,750	11,400
3	37,500	174,000	20,700	16,300	29,600	34,800	18	148,000	32,800	21,800	17,400	9,350	14,300
4	34,800	169,000	22,900	14,800	23,500	28,300	19	144,000	34,100	21,200	16,300	8,580	16,300
5	30,800	167,000	23,500	14,300	16,900	20,100	20	132,000	32,800	20,100	15,800	8,580	16,300
6	29,600	162,000	22,900	13,800	17,900	17,900	21	124,000	32,100	19,600	13,800	7,850	16,300
7	32,100	154,000	22,900	11,900	19,000	17,900	22	124,000	29,600	20,100	12,400	7,850	15,300
8	45,000	140,000	22,900	10,600	23,500	17,900	23	125,000	29,600	14,800	10,600	8,210	13,800
9	82,400	123,000	22,400	9,750	25,300	20,100	24	151,000	27,100	13,800	10,600	12,800	12,800
10	103,000	99,400	21,800	10,200	19,600	16,300	25	144,000	22,900	12,800	11,400	11,900	12,800
11	110,000	56,600	21,800	11,000	17,900	11,900	26	161,000	27,100	11,900	16,300	12,800	12,800
12	106,000	60,000	22,400	12,800	15,300	11,000	27	172,000	26,500	11,400	19,600	12,800	12,800
13	96,700	60,000	25,900	12,800	12,800	10,600	28	170,000	25,300	12,800	25,900	26,500	13,800
14	97,400	53,200	25,900	14,300	12,800	11,000	29	178,000	23,500	16,300	37,500	55,200	16,300
15	103,000	43,000	32,800	15,800	11,000	11,000	30	190,000	23,500	16,900	43,000	90,600	17,900
							31	.....	23,500	.....	51,800	92,600	.....

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Daily discharge, in second-feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1875.												
1	19,000	9,350	56,600	37,500	201,000	361,000	80,400	135,000	19,000	29,600	31,500	20,700
2	25,300	8,580	52,500	41,600	167,000	341,000	94,600	123,000	17,900	32,100	30,800	17,900
3	27,700	8,580	48,400	79,000	110,000	307,000	126,000	80,400	17,900	30,200	30,200	17,900
4	27,100	8,580	38,900	85,800	72,200	288,000	133,000	65,400	19,600	29,600	30,200	17,900
5	22,400	7,850	28,300	93,300	64,700	278,000	123,000	57,900	22,900	28,900	34,100	17,400
6	11,900	7,160	28,300	82,400	58,600	267,000	110,000	52,500	27,100	28,300	45,000	16,900
7	11,900	6,830	25,300	72,200	51,100	246,000	89,200	46,400	26,500	29,600	30,200	16,300
8	12,400	6,830	22,900	83,800	49,800	212,000	74,200	43,000	24,700	30,830	30,800	15,800
9	11,900	7,850	20,700	60,600	42,300	174,000	64,700	39,600	27,100	34,100	28,300	14,800
10	11,900	9,750	16,900	58,600	38,900	145,000	57,900	37,500	27,700	33,400	25,300	14,800
11	11,900	15,800	16,300	54,500	37,500	129,000	62,000	36,200	25,300	32,100	24,700	14,800
12	11,000	22,400	15,800	40,200	40,900	108,000	77,000	36,200	22,400	36,200	25,300	15,800
13	10,600	21,800	20,700	36,200	44,300	90,600	83,800	34,800	20,700	45,000	28,300	15,300
14	10,600	20,100	20,700	34,800	47,000	81,000	77,000	32,100	17,900	56,600	30,800	14,300
15	10,600	19,000	21,200	33,400	53,800	79,000	65,400	30,800	17,400	72,900	34,100	14,800
16	9,350	17,400	49,800	28,300	56,600	137,000	58,600	28,900	16,900	130,000	47,700	14,800
17	8,580	16,300	49,800	27,700	51,100	176,000	53,200	27,100	21,200	119,000	67,400	14,800
18	8,210	14,300	48,400	27,100	46,400	185,000	48,400	25,900	21,800	87,200	77,000	15,300
19	10,200	11,900	47,700	26,500	43,000	171,000	45,000	25,300	26,500	66,100	70,200	37,500
20	15,800	13,800	38,200	25,300	41,600	145,000	42,300	23,500	25,900	51,100	64,700	70,200
21	16,900	14,800	36,200	24,100	45,700	193,000	40,900	24,100	26,500	46,400	55,200	62,000
22	14,800	13,800	34,800	23,500	51,800	216,000	42,300	23,500	25,900	39,600	42,300	43,000
23	12,800	55,200	37,500	22,900	51,800	225,000	47,000	22,900	29,600	43,000	35,500	33,400
24	12,800	59,300	45,700	28,300	116,000	223,000	51,800	22,400	32,100	60,600	31,500	28,900
25	12,800	66,800	40,900	47,700	235,000	184,000	60,600	22,400	32,100	82,400	29,600	25,300
26	11,900	67,400	36,200	56,600	299,000	120,000	51,800	21,800	30,200	75,600	29,600	22,900
27	11,000	43,000	29,600	51,100	331,000	92,600	46,400	21,800	28,300	66,800	29,600	20,700
28	9,750	43,000	27,700	47,700	357,000	77,000	55,200	22,400	26,500	60,600	28,300	19,600
29	9,750	36,200	32,800	106,000	.....	92,600	96,000	22,400	25,900	47,700	26,500	19,000
30	9,750	59,300	34,830	188,000	.....	100,000	127,000	21,200	26,500	40,200	23,500	19,600
31	11,900	.....	36,800	215,000	.....	92,600	.....	19,600	.....	34,100	22,400	.....
1876.												
1	19,600	13,300	36,200	205,000	87,200	41,600	77,000	45,700	49,100	40,200	24,700	14,300
2	17,900	13,800	33,400	153,000	87,800	39,600	83,800	55,200	47,000	36,200	25,900	13,800
3	17,900	13,800	32,800	100,000	87,800	37,500	85,800	77,000	46,400	37,500	29,600	16,900
4	17,900	13,800	33,400	81,000	81,000	36,200	76,300	83,800	48,400	39,600	27,100	16,300
5	16,900	13,800	38,200	69,500	79,000	34,800	67,400	76,300	49,800	41,600	25,900	14,300
6	16,900	15,800	45,700	62,000	74,900	33,400	59,300	63,400	51,100	42,300	34,800	12,800
7	22,900	17,900	54,500	55,200	63,400	32,100	53,800	62,000	51,100	46,400	32,800	12,400
8	32,100	22,400	53,800	49,100	62,000	34,100	49,800	70,200	46,400	43,000	29,600	12,400
9	29,600	26,500	55,900	45,000	63,400	40,900	46,400	106,000	40,900	41,600	27,700	11,900
10	24,700	29,600	55,200	41,600	64,700	48,400	43,000	130,000	35,500	38,900	25,900	11,900
11	22,400	32,100	53,200	40,200	63,400	47,000	41,600	130,000	32,100	36,800	24,700	12,800
12	20,100	37,500	49,800	39,600	64,700	45,700	39,600	118,000	29,600	34,800	25,300	13,800
13	19,000	39,600	45,700	36,200	70,200	42,300	37,500	97,400	28,300	32,100	23,500	14,300
14	17,400	38,900	41,600	34,800	81,000	41,600	40,200	77,000	27,700	29,600	22,400	13,800
15	16,900	37,500	37,500	32,800	108,000	43,600	63,400	64,700	27,100	27,100	20,700	12,800
16	15,800	37,500	34,100	30,800	136,000	68,800	85,100	58,600	30,800	27,100	20,100	12,800
17	15,800	40,200	31,500	29,600	143,000	129,000	76,300	53,800	67,400	27,100	20,700	12,800
18	15,800	38,200	29,600	34,100	122,000	137,000	74,200	49,100	118,000	27,700	21,200	11,900
19	15,800	33,400	27,100	51,100	103,000	115,000	63,400	46,400	144,000	27,100	20,100	11,900
20	15,300	31,500	25,300	80,400	77,000	90,600	56,600	46,400	153,000	28,900	19,600	11,400
21	14,800	29,600	23,500	92,600	64,700	77,000	53,200	48,400	125,000	27,700	19,000	11,900
22	14,300	26,200	23,500	92,600	60,600	69,500	50,400	46,400	74,200	28,300	17,900	14,800
23	14,300	32,100	22,400	83,100	60,600	62,700	43,000	46,400	68,800	29,600	16,900	14,300
24	13,900	34,800	23,500	74,900	57,200	60,600	40,900	43,000	56,600	26,500	16,300	13,800
25	12,800	38,900	27,700	79,000	53,200	81,000	39,600	39,600	49,100	23,500	15,800	13,800
26	12,800	43,000	47,700	101,000	51,800	109,000	38,200	41,600	48,400	22,400	16,300	15,800
27	12,800	40,200	82,400	91,900	48,400	111,000	36,200	43,000	51,800	21,200	16,300	19,000
28	12,800	40,200	125,000	75,600	46,400	102,000	34,800	48,400	49,100	21,200	15,800	17,400
29	12,800	40,200	180,000	66,100	43,000	101,000	36,200	67,400	47,700	20,100	15,800	14,800
30	12,800	38,900	218,000	75,600	.....	101,000	39,600	60,600	43,000	19,000	14,800	13,800
31	12,800	.....	227,000	93,300	.....	85,800	.....	53,800	.....	21,200	14,300	.....

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Daily discharge, in second-feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1877.												
1	12,800	10,200	13,800	17,900	36,200	17,400	65,400	71,500	19,000	22,400	13,800	11,000
2	12,400	9,750	13,800	14,800	33,400	17,900	49,800	60,600	17,900	20,700	12,800	10,600
3	11,400	9,350	13,800	11,000	32,100	24,700	63,400	53,200	17,900	19,000	12,800	9,750
4	11,000	9,350	15,300	10,600	31,500	40,200	66,100	47,700	17,400	17,400	12,800	9,750
5	11,000	9,750	14,300	13,800	32,800	32,800	60,600	44,300	16,900	14,800	12,400	9,750
6	11,000	9,750	11,900	12,800	33,400	31,500	56,600	43,600	16,300	14,300	11,900	9,350
7	10,600	9,750	11,000	15,300	32,100	30,800	58,600	45,700	15,800	13,800	11,000	11,900
8	10,200	9,750	11,000	25,900	29,600	29,600	88,500	45,700	16,900	13,800	11,000	15,300
9	9,750	9,350	11,000	34,100	28,900	41,600	150,000	47,700	17,400	15,800	10,600	14,300
10	9,750	9,350	10,600	32,800	27,700	75,600	184,000	49,800	17,900	15,800	10,600	11,900
11	9,350	9,350	10,200	29,600	25,900	100,000	189,000	49,100	17,900	13,800	10,600	13,800
12	8,580	9,350	9,750	31,500	25,300	94,600	171,000	48,400	19,600	12,800	10,600	17,900
13	8,580	9,350	9,350	33,400	23,500	82,400	133,000	45,000	20,100	12,800	10,200	17,900
14	8,210	8,580	10,200	62,000	23,500	72,200	116,000	40,900	19,600	11,900	10,200	15,800
15	8,210	8,580	11,000	86,500	22,400	72,900	112,000	37,500	19,600	11,900	10,200	12,800
16	8,210	8,580	11,400	116,000	21,200	61,300	108,000	34,800	19,000	11,400	11,400	11,900
17	8,210	9,350	12,800	140,000	21,200	55,900	96,000	33,400	19,000	14,800	12,800	11,000
18	7,850	9,350	12,800	148,000	20,100	53,800	82,400	33,400	19,000	12,400	11,900	11,000
19	7,850	9,750	12,400	154,000	19,000	52,500	74,900	30,800	19,000	12,400	10,600	11,000
20	7,850	10,600	11,900	144,000	19,000	49,800	77,000	27,700	19,600	17,400	9,750	11,900
21	8,210	11,400	11,900	152,000	17,900	46,400	89,200	27,100	20,100	20,100	9,350	14,800
22	8,210	12,800	11,000	174,000	17,900	44,300	97,400	27,100	22,900	20,700	8,960	15,300
23	9,750	12,800	11,000	178,000	17,900	42,300	101,000	27,100	28,900	20,100	8,960	16,900
24	11,900	14,300	12,800	157,000	17,900	40,900	89,200	24,700	27,700	22,900	9,350	15,800
25	19,000	19,000	13,800	120,000	19,000	39,600	72,900	23,500	22,900	29,600	9,750	14,800
26	17,900	21,800	15,800	82,400	19,000	47,000	60,600	22,400	20,700	26,500	14,300	12,800
27	14,800	19,600	16,900	68,100	17,900	62,600	57,900	21,200	19,000	26,500	13,800	12,800
28	13,800	17,400	16,900	58,600	17,400	87,800	79,000	21,200	17,900	23,500	13,800	12,800
29	12,800	15,300	17,900	49,800	.....	108,000	91,900	20,100	19,600	20,100	12,400	12,800
30	11,000	14,300	16,900	45,000	.....	99,400	79,000	20,100	22,400	17,900	11,400	11,000
31	10,600	.....	19,000	40,200	.....	77,000	.....	19,600	.....	15,300	10,600	.....
1878.												
1	10,200	12,800	43,000	53,200	72,900	51,800	27,700	40,200	22,900	12,800	15,800	22,400
2	9,750	15,300	37,500	62,700	72,200	45,000	26,500	36,200	20,100	12,800	20,100	20,700
3	9,350	35,500	32,100	55,900	63,400	43,000	25,300	34,800	19,000	14,300	17,900	19,600
4	8,580	45,000	29,600	47,000	54,500	43,000	23,500	34,800	17,900	15,300	17,400	19,600
5	8,580	36,200	29,600	43,000	48,400	49,100	24,700	32,800	17,400	14,300	15,800	17,900
6	9,750	32,100	36,200	38,200	43,000	47,700	26,500	38,200	16,900	12,800	14,300	14,800
7	12,800	29,600	44,300	34,100	40,200	46,400	27,700	40,900	17,400	12,400	11,900	12,400
8	22,400	28,300	43,000	30,800	42,300	43,000	28,300	43,000	16,900	11,900	11,000	11,400
9	17,900	25,300	38,900	27,700	49,100	40,900	28,300	44,300	16,300	12,400	10,200	10,200
10	19,000	23,500	36,200	29,600	72,900	38,900	29,600	40,900	17,900	12,800	9,350	9,350
11	17,900	27,700	32,100	39,600	83,800	37,500	40,200	37,500	19,000	13,800	8,580	8,580
12	16,300	31,500	29,600	55,200	79,000	37,500	48,400	34,100	17,900	13,800	8,580	8,210
13	15,800	29,600	27,700	70,200	68,800	44,300	48,400	31,500	17,900	12,800	9,350	7,850
14	14,300	25,300	25,900	79,000	57,900	54,500	42,300	28,900	17,900	12,400	10,200	7,500
15	12,800	22,900	23,500	71,500	49,800	62,700	38,200	27,700	17,900	12,400	12,400	7,500
16	11,900	21,200	23,500	62,000	47,000	66,100	35,500	27,100	17,900	12,400	16,300	66,100
17	11,400	20,700	21,800	54,500	45,000	55,900	33,400	26,500	16,300	12,800	22,400	49,800
18	10,200	21,200	21,200	49,800	42,300	49,800	32,100	26,500	15,800	11,900	20,700	32,100
19	10,200	19,600	20,100	45,000	40,200	43,000	30,200	29,600	15,300	12,400	16,900	22,400
20	10,600	19,000	19,600	41,600	38,900	38,900	35,500	34,100	14,800	11,400	15,300	17,400
21	13,300	19,000	19,000	38,900	40,900	36,200	36,200	41,600	15,800	11,000	13,800	15,300
22	15,300	29,600	17,900	37,500	55,200	33,400	35,500	41,600	15,300	10,200	11,900	12,800
23	17,900	40,200	17,900	38,900	72,900	31,500	33,400	33,400	15,300	10,200	16,300	11,900
24	17,900	47,700	19,000	39,600	113,000	29,600	38,900	28,900	17,900	9,750	23,500	11,400
25	17,900	60,600	24,700	38,900	125,000	28,300	58,600	26,500	16,900	8,580	21,200	11,900
26	15,800	89,900	41,600	38,200	101,000	27,700	56,600	23,500	15,300	8,580	16,300	12,400
27	14,800	96,000	47,000	38,200	78,300	25,900	51,800	22,900	14,500	8,580	12,800	11,400
28	13,300	85,100	45,000	37,500	66,800	25,900	51,100	22,400	13,800	8,210	13,800	11,400
29	13,300	66,100	43,000	40,900	.....	27,700	49,800	22,900	13,800	8,580	15,800	11,000
30	13,300	52,500	47,000	43,000	.....	29,600	45,700	25,300	12,800	9,350	17,900	10,600
31	13,300	.....	51,800	60,000	.....	29,600	.....	26,900	.....	14,300	22,900	.....

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Daily discharge, in second-feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1879.												
1	9,750	17,900	92,600	32,800	73,600	68,800	33,400	24,100	18,500	8,210	12,800	13,800
2	8,580	19,600	83,800	36,800	72,900	66,100	44,300	24,100	18,500	8,580	21,800	12,800
3	8,580	19,000	77,000	45,700	62,000	58,600	51,100	23,500	16,900	8,580	22,900	12,400
4	8,210	19,600	73,600	45,000	52,500	51,800	51,800	22,900	15,800	8,580	24,100	12,800
5	7,850	17,900	68,800	36,200	50,400	46,400	43,000	21,800	15,300	8,580	22,400	12,800
6	7,850	16,300	60,000	32,100	57,200	42,300	38,200	21,200	14,800	8,580	18,500	14,800
7	8,210	14,800	48,400	23,500	69,500	39,600	38,200	29,600	13,800	8,210	17,900	15,800
8	8,210	13,800	40,200	24,100	69,500	36,800	33,400	37,500	13,300	7,850	16,300	14,300
9	8,580	12,800	36,200	49,100	62,000	34,800	32,800	33,400	12,800	7,500	16,300	12,400
10	9,750	12,800	45,000	132,000	62,000	34,100	36,200	27,100	11,900	7,500	15,800	11,400
11	10,200	11,900	56,600	157,000	55,200	32,100	48,400	24,100	12,400	7,850	16,300	9,750
12	10,200	11,400	68,100	181,000	50,400	31,500	53,800	21,800	12,800	7,850	14,800	9,350
13	10,200	11,000	61,300	217,000	49,100	28,300	49,800	20,100	13,800	7,850	14,300	8,960
14	10,600	11,000	65,400	250,000	47,000	29,600	44,300	19,600	15,300	7,850	12,800	8,580
15	11,400	11,400	62,000	252,000	43,600	29,600	40,200	21,800	15,800	7,500	11,400	8,580
16	11,400	11,900	68,800	260,000	40,200	28,300	39,600	21,800	15,300	7,500	11,000	7,850
17	11,400	11,900	73,600	183,000	45,700	27,700	47,700	22,400	16,300	8,210	12,400	7,850
18	11,000	11,900	67,400	110,000	93,300	27,700	50,400	29,600	14,300	7,850	11,900	7,850
19	10,200	11,900	61,300	89,200	122,000	27,100	49,800	33,400	12,800	7,850	10,600	7,500
20	10,200	12,800	52,500	92,600	110,000	26,500	48,400	34,800	11,900	7,850	10,600	7,500
21	10,200	12,800	45,000	89,200	88,500	25,300	48,400	34,100	10,200	8,960	8,580	7,160
22	10,200	13,800	45,700	81,000	72,200	26,500	44,300	33,400	9,750	8,580	8,960	7,160
23	10,600	12,800	49,800	68,100	65,400	38,900	41,600	32,800	9,350	7,850	11,000	6,830
24	11,000	14,300	53,200	57,200	66,100	40,200	38,200	26,500	8,960	7,500	14,800	6,510
25	12,400	15,300	55,200	52,500	78,300	40,200	34,800	25,300	8,960	7,850	15,800	6,200
26	32,100	17,900	49,800	47,700	78,300	40,900	29,600	23,500	8,960	7,160	18,500	6,200
27	41,600	48,400	43,000	44,300	75,600	40,200	27,700	20,100	8,580	7,500	22,400	5,900
28	30,800	103,000	36,200	41,600	72,200	38,900	26,500	18,500	8,210	8,580	22,900	5,900
29	24,700	116,000	31,500	40,900	.....	37,500	25,900	17,400	7,850	10,600	21,800	5,900
30	20,700	103,000	28,900	45,700	.....	36,200	24,700	16,900	7,850	11,400	19,000	5,900
31	17,900	.....	30,800	49,800	.....	33,400	.....	17,400	.....	11,000	15,800	.....
1880.												
1	5,610	13,800	31,500	47,700	23,500	55,200	47,700	92,600	31,500	17,900	11,000	13,800
2	5,610	13,300	27,100	43,000	24,100	49,100	45,700	92,600	32,800	16,900	10,600	12,800
3	5,610	12,800	25,300	38,900	28,300	45,700	55,200	82,400	34,800	19,000	11,000	12,400
4	5,610	11,900	22,400	34,800	36,200	57,200	92,600	73,600	36,200	30,200	11,400	13,800
5	5,330	11,400	20,700	32,100	39,600	87,200	109,000	61,300	31,500	47,000	14,800	16,300
6	5,330	11,000	20,700	30,800	36,200	110,000	99,400	53,200	29,600	40,200	15,800	17,400
7	5,330	10,600	27,100	38,200	33,400	101,000	82,400	48,400	27,100	33,400	14,800	17,400
8	5,330	10,200	27,100	47,000	30,800	100,000	77,600	45,000	24,700	32,100	24,100	16,300
9	5,330	10,200	26,500	58,600	28,300	123,000	68,100	40,200	23,500	26,500	23,500	15,800
10	5,330	9,750	24,700	66,100	25,900	161,000	59,300	37,500	22,400	23,500	23,500	13,800
11	8,960	10,200	40,900	62,000	24,700	184,000	52,500	34,800	20,700	21,800	25,900	15,800
12	10,200	11,900	98,300	59,300	24,700	187,000	53,800	34,100	19,600	20,100	21,800	17,900
13	12,800	12,400	96,000	54,500	30,800	189,000	47,000	33,400	19,600	18,500	20,700	20,700
14	11,400	12,400	77,000	48,400	78,300	188,000	41,600	32,100	19,000	17,900	21,200	21,200
15	10,600	12,400	87,800	45,700	150,000	188,000	38,200	30,800	17,900	16,900	24,100	19,600
16	8,960	11,900	116,000	41,600	176,000	211,000	49,100	29,600	16,900	16,300	20,100	17,900
17	8,960	12,400	115,000	38,200	176,000	232,000	69,500	27,100	16,300	24,700	20,700	16,300
18	10,600	15,800	100,000	36,200	129,000	254,000	77,000	25,900	15,800	21,200	16,900	15,800
19	37,500	24,100	78,300	34,800	75,600	250,000	72,200	24,100	15,800	21,200	15,800	12,800
20	85,100	27,700	61,300	33,400	58,600	237,000	66,100	23,500	15,800	15,800	14,800	11,900
21	68,800	25,900	48,400	32,100	52,500	184,000	70,800	23,500	15,300	13,800	13,800	11,000
22	57,200	23,500	43,000	30,800	47,700	137,000	74,900	23,500	14,300	14,300	19,000	10,200
23	44,300	19,000	52,500	32,100	44,300	107,000	66,100	28,900	13,800	14,800	20,100	9,350
24	32,800	16,900	110,000	30,800	40,900	88,500	60,000	32,100	13,300	16,300	21,200	9,750
25	32,800	15,300	138,000	29,600	37,500	75,600	55,200	33,400	13,300	17,900	22,400	9,350
26	22,900	14,300	143,000	27,100	34,800	66,800	62,700	46,400	13,300	17,400	24,100	9,350
27	21,200	13,300	141,000	25,900	45,000	60,000	82,400	44,300	12,800	16,900	25,900	9,750
28	19,000	13,300	115,000	25,300	57,200	56,600	89,200	38,900	12,800	15,300	27,100	11,900
29	16,900	16,300	91,900	24,100	56,600	53,800	79,700	34,100	12,800	13,800	15,800	17,400
30	16,300	27,700	71,500	23,500	.....	52,500	87,200	32,100	15,800	12,800	15,300	22,400
31	14,800	.....	57,900	23,500	.....	49,800	.....	32,100	.....	11,900	14,800	.....

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Daily discharge in second-feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1881.												
1	19,000	8,580	113,000	24,700	34,100	55,200	48,400	53,800	18,500	12,400	7,850	5,060
2	16,900	8,580	153,000	17,900	38,200	53,800	50,400	48,400	19,000	17,400	7,500	6,200
3	15,300	9,750	174,000	19,000	64,000	49,100	51,100	45,000	20,100	19,600	7,160	7,500
4	13,300	12,800	144,000	20,700	68,800	46,400	49,100	41,600	24,700	20,100	6,830	8,210
5	12,800	11,900	102,000	24,100	63,400	43,000	46,400	40,900	25,300	20,100	6,510	7,500
6	11,400	12,800	98,700	37,500	53,800	41,600	43,000	43,000	23,500	17,400	6,510	6,830
7	11,000	13,800	117,000	55,900	45,700	38,900	41,600	43,000	21,800	14,800	7,160	5,900
8	10,600	13,800	112,000	67,400	46,400	40,900	41,600	40,900	21,800	13,300	7,500	5,330
9	10,200	14,300	93,300	74,200	61,300	40,200	40,900	38,900	22,400	11,900	7,850	5,060
10	9,750	16,300	70,200	74,900	86,500	37,500	47,000	37,500	28,300	11,000	8,210	5,060
11	9,350	21,200	53,800	74,200	109,000	36,200	53,200	37,500	28,900	10,200	18,500	4,800
12	9,350	23,500	45,000	79,700	128,000	35,500	61,300	33,400	25,900	9,350	16,900	4,800
13	8,960	23,500	39,600	74,200	146,000	36,200	77,000	31,500	22,400	9,350	13,300	4,800
14	8,580	22,900	35,500	70,200	142,000	35,500	101,000	29,600	20,100	10,200	13,300	4,800
15	8,580	23,500	32,800	62,700	116,000	35,500	116,000	28,900	20,100	9,750	8,960	5,330
16	7,850	20,700	31,500	60,000	94,000	45,000	116,000	27,100	22,400	11,900	8,210	5,330
17	8,580	19,000	34,800	57,200	75,600	54,500	103,000	25,900	21,800	11,900	7,850	5,330
18	8,580	16,900	33,400	52,500	62,700	66,100	81,000	24,700	19,000	12,400	6,510	9,350
19	8,960	15,300	43,600	48,400	64,700	88,500	67,400	23,500	18,500	11,900	8,210	28,300
20	8,580	13,800	43,000	52,500	78,300	125,000	60,000	22,900	15,800	11,000	6,830	28,300
21	8,580	13,300	41,600	82,400	91,900	125,000	53,800	22,400	14,800	15,300	7,160	72,200
22	8,210	12,800	38,900	112,000	91,900	97,400	48,400	21,200	14,800	12,800	7,160	48,400
23	8,210	11,900	35,500	122,000	87,800	81,700	47,700	21,200	17,900	11,000	6,200	33,400
24	7,850	11,000	33,400	112,000	70,200	71,500	48,400	21,800	16,900	9,350	6,200	23,500
25	8,210	11,000	31,500	98,700	60,000	62,000	51,100	21,800	15,800	8,960	6,510	19,000
26	8,210	10,600	32,100	70,800	54,500	56,600	55,200	22,400	14,300	10,200	6,510	13,300
27	7,850	10,600	34,800	56,600	48,400	53,200	67,400	21,200	13,300	11,000	6,200	14,800
28	7,850	13,300	34,800	48,400	53,200	55,200	74,200	20,100	12,800	10,600	5,610	14,800
29	8,210	42,300	33,400	41,600	.....	53,800	65,400	19,000	12,800	10,600	6,200	15,800
30	7,850	85,800	30,800	38,200	.....	50,400	55,200	18,500	12,800	9,350	5,900	16,900
31	8,210	.....	25,900	35,500	.....	49,100	.....	17,900	.....	8,580	5,330	.....
1882.												
1	15,800	40,200	28,300	101,000	197,000	83,800	70,200	40,900	51,100	25,900	22,400	32,100
2	15,300	60,600	28,300	89,900	194,000	124,000	61,300	38,200	53,800	34,800	24,100	34,100
3	13,800	56,600	35,500	74,900	130,000	144,000	54,500	34,800	62,000	36,800	27,100	36,800
4	12,800	51,100	35,500	62,700	118,000	130,000	51,100	32,100	55,900	35,500	36,200	30,800
5	10,600	38,900	34,100	54,500	145,000	114,000	47,700	29,600	52,500	34,100	35,500	29,600
6	8,960	30,200	33,400	57,900	160,000	94,000	44,300	28,300	48,400	40,900	36,800	27,100
7	8,580	25,900	30,800	85,800	150,000	84,400	43,000	30,200	47,700	38,900	34,800	23,500
8	8,210	25,900	27,700	140,000	127,000	85,100	44,300	29,600	38,200	32,100	30,800	21,200
9	7,850	23,500	25,900	176,000	120,000	101,000	48,400	28,900	32,800	27,700	27,700	22,900
10	7,500	34,800	23,500	195,000	130,000	123,000	51,800	27,700	30,200	24,100	26,500	24,100
11	7,500	36,200	21,200	197,000	148,000	137,000	60,000	36,200	27,700	21,800	24,700	30,800
12	7,160	37,500	20,700	197,000	153,000	112,000	58,600	32,800	26,500	21,200	22,900	76,300
13	7,160	38,900	19,000	200,000	154,000	99,400	53,800	29,600	25,300	21,800	21,800	142,000
14	7,160	40,200	24,100	202,000	144,000	94,600	56,600	40,200	26,500	23,500	20,700	149,000
15	6,830	38,900	74,200	200,000	133,000	85,800	45,700	34,100	28,300	28,300	19,000	111,000
16	6,830	34,100	112,000	199,000	139,000	70,200	43,000	32,800	27,100	38,200	17,900	67,400
17	6,510	29,600	108,000	222,000	144,000	61,300	41,600	30,200	26,500	34,100	17,900	46,400
18	6,510	25,900	98,000	250,000	133,000	62,700	38,200	30,200	32,800	27,100	22,400	37,500
19	6,200	22,400	75,600	267,000	118,000	72,200	35,500	28,300	47,700	22,900	29,600	31,500
20	6,510	20,700	53,800	267,000	108,000	63,400	33,400	25,900	49,100	22,400	28,900	27,100
21	6,200	19,000	47,700	261,000	99,400	60,600	32,100	25,300	43,000	24,100	25,900	24,700
22	5,900	17,900	98,700	258,000	91,200	61,300	31,500	28,900	37,500	24,100	21,200	25,300
23	7,160	19,000	131,000	258,000	86,500	60,600	49,100	32,100	34,800	23,500	17,900	22,400
24	7,850	34,800	119,000	250,000	80,400	60,600	63,400	32,800	35,500	22,400	15,800	21,200
25	7,850	60,600	100,000	229,000	72,900	57,900	62,700	33,400	36,200	20,700	14,300	20,100
26	7,500	60,000	94,600	180,000	66,100	53,800	58,600	32,100	36,800	19,000	13,800	19,000
27	8,210	62,000	90,600	118,000	60,000	53,200	55,200	40,200	35,500	18,500	15,800	17,900
28	8,580	52,500	95,300	94,600	57,200	64,700	49,800	38,900	28,900	19,000	16,900	16,900
29	8,960	38,200	101,000	138,000	.....	84,400	46,400	45,000	28,300	20,100	21,200	16,300
30	11,900	32,100	109,000	195,000	.....	86,500	43,000	53,200	26,500	20,700	23,500	16,300
31	17,400	.....	107,000	200,000	.....	79,700	.....	53,200	.....	19,000	26,500	.....

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Daily discharge, in second-feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1883.												
1	16,900	13,800	26,500	25,300	57,900	47,700	96,700	68,800	21,200	22,900	9,750	9,750
2	15,800	15,300	23,500	24,700	55,200	43,600	159,000	64,000	21,200	22,400	9,350	8,960
3	15,800	16,300	20,700	22,900	49,100	40,900	172,000	56,600	19,600	20,100	9,750	8,210
4	15,300	15,300	18,500	21,200	45,700	38,900	154,000	51,100	18,500	18,500	10,200	7,500
5	14,800	14,300	16,900	21,800	45,000	36,200	108,000	47,000	17,900	16,900	11,400	7,160
6	14,800	12,800	15,800	25,300	47,000	34,800	80,400	43,600	19,000	16,300	10,200	6,830
7	14,300	11,900	15,360	44,300	57,900	38,200	87,800	40,900	20,700	15,300	9,750	6,510
8	13,800	11,400	14,300	70,800	68,100	50,400	104,000	38,900	27,100	15,300	10,600	6,200
9	12,800	11,000	12,800	81,000	94,600	60,000	110,000	36,200	30,800	15,800	11,900	5,900
10	12,800	11,000	12,800	78,300	114,000	60,600	109,000	34,800	30,200	16,300	11,400	5,900
11	11,900	10,600	13,300	70,800	106,000	57,200	110,000	34,100	28,900	16,300	10,200	5,610
12	11,400	10,600	20,700	67,900	92,600	51,800	112,000	34,100	26,500	17,900	8,960	5,330
13	11,000	11,000	19,000	50,400	84,400	49,800	118,000	33,400	32,100	22,400	8,580	5,330
14	11,000	11,900	18,500	58,600	85,800	47,700	121,000	32,100	34,800	22,400	8,960	5,060
15	11,000	15,300	19,000	91,900	83,100	42,300	111,000	30,800	40,900	20,100	9,350	5,060
16	11,000	15,800	18,500	107,000	74,200	39,600	96,000	30,800	38,200	19,600	9,750	5,060
17	11,000	15,300	17,400	101,000	67,400	37,500	89,200	30,800	33,400	17,900	13,800	5,060
18	10,600	14,800	16,300	110,000	62,000	35,500	96,700	29,600	28,300	15,800	13,300	5,060
19	11,000	13,800	14,300	129,000	61,300	33,400	100,000	27,700	25,300	16,900	14,800	4,800
20	11,900	12,800	14,800	148,000	64,700	32,100	94,000	27,100	22,900	15,800	14,300	5,060
21	16,300	13,300	19,000	199,000	64,700	31,500	79,700	25,300	20,700	13,300	12,400	5,330
22	24,100	14,800	24,700	233,000	60,600	30,800	69,500	25,300	20,100	12,400	11,000	6,200
23	22,400	14,800	39,600	254,000	55,900	29,600	114,000	25,300	19,600	11,000	10,200	6,830
24	19,000	14,300	55,900	252,000	53,800	28,300	176,000	25,900	21,200	10,200	9,350	10,600
25	17,900	12,800	62,000	218,000	56,600	28,300	208,000	25,300	25,900	10,200	9,350	11,900
26	15,300	11,900	56,600	145,000	57,200	33,400	215,000	24,700	23,500	10,200	8,960	11,400
27	12,800	11,900	49,100	87,200	55,900	36,800	188,000	24,100	21,800	11,000	10,600	13,300
28	12,400	12,400	42,300	68,800	51,100	36,800	129,000	24,100	23,500	11,900	8,960	14,300
29	11,900	12,400	34,100	62,000	.....	37,500	87,800	24,100	22,900	11,000	8,960	12,800
30	11,400	23,500	30,200	60,000	.....	36,800	74,900	22,400	23,500	9,750	9,750	11,400
31	11,900	.....	27,700	59,300	.....	44,300	.....	21,800	.....	9,350	10,200	.....
1884.												
1	9,750	18,500	24,100	38,900	72,200	58,600	72,200	62,700	22,900	50,400	35,500	17,900
2	8,580	19,600	21,800	37,500	127,000	55,900	66,100	56,600	21,800	43,600	60,600	15,300
3	10,200	17,400	19,600	35,500	161,000	52,500	62,700	54,500	21,200	40,200	43,000	12,800
4	8,960	15,300	17,400	34,100	167,000	49,800	61,300	55,200	21,200	41,600	31,500	11,900
5	9,350	12,400	16,300	31,500	133,000	47,700	57,900	54,500	19,600	39,600	34,800	10,600
6	11,000	11,000	15,300	28,900	87,200	98,700	53,800	63,400	19,000	38,200	28,900	9,750
7	10,600	10,200	14,300	25,300	84,400	193,000	49,800	71,500	28,300	38,200	22,400	8,960
8	15,800	9,350	14,300	21,800	142,000	244,000	55,200	65,400	30,800	34,800	19,600	8,580
9	35,500	9,350	16,900	19,600	201,000	272,000	51,800	57,900	30,800	33,400	17,900	8,960
10	27,100	8,960	20,100	19,000	233,000	285,000	43,600	51,100	29,600	28,300	17,400	9,750
11	20,700	9,350	22,900	20,100	244,000	282,000	41,600	47,700	34,100	27,700	17,900	10,200
12	15,800	11,000	20,700	28,900	242,000	267,000	40,200	41,600	43,600	28,900	19,600	9,750
13	13,300	14,800	20,100	53,200	225,000	248,000	38,200	40,900	51,100	34,100	19,600	9,750
14	11,000	18,500	18,500	57,900	205,000	237,000	38,900	37,500	52,500	32,100	19,000	8,960
15	10,200	19,000	17,900	62,000	195,000	222,000	58,600	36,200	53,800	28,300	17,900	8,580
16	8,960	16,300	18,500	75,600	189,000	199,000	92,600	34,800	51,800	27,100	17,400	8,210
17	8,210	14,300	19,600	81,700	176,000	163,000	109,000	33,400	41,600	23,500	15,800	7,850
18	8,210	12,800	17,900	76,300	165,000	129,000	96,700	31,500	36,800	21,200	14,300	7,850
19	7,850	12,400	17,900	78,300	167,000	114,000	83,100	29,600	34,800	23,500	12,800	7,850
20	7,500	11,000	21,200	87,800	178,000	120,000	70,200	29,600	30,200	23,500	11,900	7,500
21	7,500	10,200	28,900	94,600	177,000	146,000	62,000	27,700	26,500	22,400	11,400	7,500
22	7,500	12,400	31,500	87,200	152,000	169,000	71,500	28,300	23,500	19,600	11,900	7,160
23	7,500	36,200	30,200	75,600	121,000	182,000	86,500	28,300	22,900	17,900	11,400	7,160
24	8,580	61,300	32,800	68,800	101,000	178,000	87,800	26,500	23,500	16,300	11,900	7,160
25	9,750	68,100	41,600	70,200	84,400	157,000	96,700	27,100	22,900	14,800	12,800	6,830
26	11,000	57,200	66,800	67,400	73,600	137,000	98,700	27,100	23,500	15,800	12,800	6,830
27	9,750	45,700	81,000	57,200	64,000	133,000	86,500	27,100	28,300	16,900	11,900	6,830
28	8,960	35,500	82,400	52,500	60,600	129,000	76,300	30,800	67,400	17,900	11,000	6,510
29	9,750	30,200	64,000	47,700	59,300	125,000	72,900	29,600	71,500	21,800	11,000	6,510
30	10,600	27,100	47,700	45,000	.....	103,000	71,500	25,900	62,000	22,900	11,400	6,510
31	12,800	.....	41,600	45,000	.....	83,100	.....	24,100	.....	21,800	12,400	.....

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Daily discharge, in second-feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1885.												
1	6,510	8,580	9,750	20,100	47,700	51,800	36,800	25,900	120,000	31,500	17,400	9,750
2	6,830	8,580	9,750	20,700	43,000	49,100	35,500	25,300	109,000	26,600	16,900	10,200
3	6,830	8,210	8,960	21,800	40,900	47,700	34,100	25,300	81,000	22,400	15,800	11,000
4	6,510	8,210	8,580	21,800	39,600	47,000	34,100	25,300	58,600	20,100	16,300	11,000
5	6,200	7,850	8,210	20,100	37,500	47,000	34,800	25,300	46,400	19,600	17,400	10,200
6	6,200	7,850	8,210	21,800	36,800	45,000	37,500	24,100	38,900	20,700	19,600	9,350
7	6,200	7,850	8,210	31,500	36,800	40,900	34,800	23,500	33,400	28,300	17,900	9,350
8	5,900	7,850	8,580	40,200	38,200	36,800	33,400	22,400	33,400	30,800	16,300	9,750
9	5,900	7,850	11,000	40,900	40,200	34,100	32,100	32,100	30,800	24,100	16,300	9,750
10	5,900	7,160	12,400	38,900	46,400	32,100	30,800	34,800	30,800	21,800	17,900	9,750
11	5,900	6,830	13,300	35,500	53,800	30,200	29,600	33,400	30,800	20,100	16,300	9,350
12	5,610	6,830	12,800	56,600	59,300	28,300	28,300	32,100	28,900	19,600	14,300	8,960
13	5,610	6,830	11,900	103,000	57,900	28,900	27,100	28,300	27,100	16,900	14,300	8,580
14	5,610	6,830	13,300	114,000	55,200	32,100	25,900	25,900	25,900	17,900	19,000	8,580
15	5,330	6,830	20,700	94,600	47,700	41,600	24,700	24,100	24,100	19,000	21,200	8,210
16	5,330	6,830	22,900	103,000	43,000	44,300	23,500	22,400	22,400	20,700	24,700	8,210
17	5,330	6,510	25,300	147,000	40,200	52,500	22,900	21,200	22,400	25,300	23,500	7,850
18	5,330	6,830	23,500	174,000	38,900	56,600	25,300	20,700	23,500	24,700	20,100	7,850
19	5,330	6,830	22,900	161,000	34,800	52,500	37,500	19,600	26,500	20,700	17,900	7,500
20	5,330	7,160	20,100	119,000	34,800	47,000	80,400	19,000	25,900	17,400	15,800	6,830
21	5,330	7,850	19,600	91,900	33,400	42,300	99,400	19,600	25,900	15,800	14,800	11,000
22	5,330	7,850	55,200	64,700	30,800	39,600	67,400	25,300	22,900	16,300	12,800	12,800
23	5,330	7,850	79,700	50,400	28,300	36,200	48,400	25,900	22,400	16,300	12,400	12,800
24	5,610	7,500	79,000	51,100	28,300	34,800	40,200	28,300	22,400	16,300	11,400	12,800
25	5,900	7,500	66,800	71,500	34,800	32,800	34,800	32,100	21,200	15,800	11,000	11,400
26	6,510	8,960	60,400	100,000	45,700	30,800	32,100	36,200	19,600	15,800	10,600	11,400
27	6,830	11,000	41,600	95,300	51,100	29,600	29,600	40,200	19,000	15,800	10,200	10,200
28	7,160	10,600	32,100	85,100	51,800	28,900	28,300	48,400	20,100	17,400	9,350	9,350
29	7,160	11,000	27,100	74,200	.....	29,600	27,100	50,400	24,700	19,000	9,350	8,960
30	7,850	9,750	23,500	62,700	.....	33,400	26,500	64,000	27,700	21,200	8,960	9,750
31	7,850	.....	21,200	53,800	.....	36,800	.....	89,200	.....	19,000	8,960	.....
1886.												
1	15,300	104,000	28,300	28,900	62,000	62,000	314,000	37,500	45,700	41,600	24,700	19,000
2	52,500	89,200	25,900	29,600	57,200	57,900	341,000	38,200	47,000	40,200	23,500	18,500
3	45,700	68,800	30,200	49,100	51,800	55,200	349,000	39,600	50,400	60,600	23,300	18,500
4	35,500	49,800	33,400	116,000	48,400	45,000	336,000	39,600	48,400	72,900	32,100	17,900
5	28,300	40,200	34,800	144,000	45,700	41,600	304,000	43,600	48,400	70,800	34,800	17,900
6	25,900	38,200	33,400	142,000	43,000	40,200	276,000	47,000	50,400	68,800	38,900	17,900
7	20,700	68,800	32,800	132,000	41,600	36,200	264,000	54,500	49,800	79,000	41,600	16,900
8	16,900	164,000	30,800	127,000	36,200	34,800	261,000	55,200	48,400	82,400	42,300	16,300
9	15,300	201,000	34,800	92,600	33,400	33,400	254,000	57,200	55,200	86,500	39,600	15,300
10	13,300	191,000	53,200	77,600	31,500	31,500	225,000	62,000	62,700	87,800	37,500	14,800
11	12,400	169,000	67,400	53,800	40,200	30,800	157,000	65,400	66,100	68,800	34,800	14,300
12	11,900	119,000	49,800	47,700	55,200	28,300	106,000	67,400	82,400	62,000	33,400	14,300
13	13,300	79,000	51,100	41,700	79,700	29,600	88,500	58,600	86,500	57,900	31,500	14,300
14	20,100	60,000	101,000	35,600	83,100	30,800	75,600	53,800	89,200	55,200	30,800	13,800
15	35,500	52,500	135,000	29,600	72,900	33,400	65,400	49,800	75,600	52,500	28,300	15,800
16	35,500	45,700	140,000	43,600	66,100	34,800	60,600	47,000	65,400	49,800	27,100	16,900
17	28,300	40,900	126,000	61,300	57,900	33,400	55,200	37,500	64,000	48,400	27,100	17,400
18	22,900	37,500	116,000	78,300	51,800	31,500	54,500	34,800	66,100	46,400	25,900	16,900
19	20,100	34,800	70,200	79,700	48,400	30,800	51,800	32,800	70,200	44,300	25,300	16,300
20	21,200	34,100	63,400	80,400	43,000	28,300	50,400	45,700	67,400	41,600	24,700	15,800
21	17,400	32,100	55,900	81,000	40,200	51,100	49,100	50,400	66,100	38,200	24,100	14,800
22	24,700	30,800	44,300	81,700	38,200	78,300	47,000	60,600	77,000	35,500	22,900	13,800
23	18,500	30,800	35,500	89,200	36,200	92,600	44,300	65,400	103,000	33,400	22,400	13,300
24	18,500	34,800	37,500	96,000	34,800	91,200	40,900	55,200	89,200	31,500	22,400	13,300
25	15,800	34,800	36,200	91,900	33,400	74,900	39,600	51,100	81,000	30,800	25,300	12,800
26	15,300	33,400	35,500	87,800	40,200	56,600	38,200	53,800	72,900	29,600	29,600	12,400
27	13,800	29,600	34,100	79,000	44,300	51,800	37,500	56,600	59,300	28,300	24,700	11,900
28	13,800	27,100	33,400	78,300	62,000	74,200	37,500	53,800	51,800	27,700	21,200	11,900
29	25,900	27,100	30,800	72,900	.....	110,000	35,500	51,100	48,400	26,500	20,100	11,900
30	61,300	24,700	28,900	64,700	.....	201,000	34,800	49,800	43,000	25,900	19,600	11,900
31	99,400	.....	28,300	64,000	.....	269,000	.....	47,000	.....	25,900	19,600	.....

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Daily discharge, in second-feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1915—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1887.												
1	11,400	10,600	38,200	68,800	104,000	180,000	29,600	38,900	40,200	20,100	20,100	22,400
2	11,400	10,200	32,100	65,400	80,400	130,000	29,600	36,200	48,400	19,600	19,000	19,000
3	11,000	9,750	28,300	62,000	64,000	110,000	28,900	34,800	55,900	19,000	18,500	16,900
4	11,000	9,750	27,100	55,200	89,900	92,600	28,300	33,400	58,600	19,000	19,600	15,800
5	11,000	9,350	25,300	49,800	123,000	70,200	28,300	32,800	57,900	19,000	51,100	14,800
6	11,000	9,350	25,300	45,000	137,000	56,600	28,300	32,100	57,200	18,500	66,100	13,800
7	11,000	9,350	28,900	41,600	142,000	48,400	28,300	32,100	62,700	20,700	55,900	12,800
8	10,600	9,350	29,600	37,500	97,400	44,300	28,300	32,100	64,700	25,900	49,800	12,800
9	10,200	10,200	29,600	34,800	74,900	103,000	27,700	34,100	60,000	30,800	46,400	12,400
10	10,200	9,750	25,900	33,400	68,100	142,000	27,700	31,500	58,600	32,100	36,800	11,900
11	10,200	9,350	23,500	32,100	60,000	157,000	27,700	30,800	54,500	28,300	32,800	11,900
12	10,200	9,350	22,400	30,200	60,000	126,000	27,100	30,800	51,800	24,700	28,300	11,000
13	10,200	9,350	41,600	28,300	56,600	91,200	27,100	30,200	41,600	21,200	25,300	10,600
14	9,750	9,350	49,800	28,300	52,500	64,000	26,500	30,200	34,100	17,400	23,500	10,600
15	9,350	11,000	55,200	31,500	55,200	60,600	26,500	29,600	31,500	15,800	21,800	10,200
16	9,350	11,900	59,300	36,200	81,000	54,500	25,900	28,900	29,600	14,300	21,200	9,750
17	9,350	13,800	72,900	40,200	85,100	48,400	25,900	28,300	28,300	13,300	20,100	9,750
18	9,350	15,800	62,700	41,600	78,300	45,000	25,300	28,300	27,700	11,900	20,100	9,350
19	8,960	29,600	55,200	38,200	73,200	41,600	24,700	27,100	27,100	11,900	22,900	8,960
20	8,960	38,200	89,200	35,500	66,100	38,900	24,100	26,500	25,900	11,400	22,900	9,350
21	8,960	45,000	103,000	32,800	110,000	36,200	23,500	26,500	25,300	12,400	24,100	9,350
22	8,960	34,800	107,000	30,800	123,000	34,100	23,500	25,900	25,300	12,800	22,400	9,350
23	8,580	41,600	70,200	28,900	115,000	32,100	62,000	25,900	25,300	14,800	21,200	9,350
24	8,580	66,100	52,500	82,400	123,000	37,500	97,400	25,900	26,500	17,900	20,700	9,350
25	8,580	79,700	41,600	127,000	152,000	35,500	116,000	29,600	27,100	19,000	18,500	8,960
26	8,580	82,400	38,900	142,000	166,000	33,400	130,000	33,400	25,900	17,900	18,500	9,350
27	8,960	85,100	40,900	135,000	176,000	32,100	138,000	34,800	25,300	17,900	20,100	9,750
28	10,600	87,200	47,700	112,000	180,000	31,500	103,000	34,800	22,400	19,000	27,100	11,400
29	11,900	68,800	62,000	89,200	.....	30,800	68,800	31,500	21,200	19,000	33,400	12,800
30	11,900	62,000	66,100	87,800	.....	30,200	43,600	28,900	20,700	19,600	30,800	13,800
31	11,000	.....	66,800	96,000	.....	29,600	.....	28,300	.....	20,100	25,900	.....
1888.												
1	17,400	16,900	10,600	48,400	30,800	48,400	154,000	25,900	50,400	42,300	11,900	19,600
2	19,000	15,300	10,200	92,600	30,200	41,600	117,000	25,900	51,100	34,800	14,800	34,800
3	20,700	13,800	10,200	94,000	29,600	37,500	90,600	25,900	56,600	28,300	13,800	47,700
4	19,600	13,300	10,200	72,200	30,800	34,800	70,200	24,100	47,700	24,700	13,800	41,600
5	15,800	12,800	10,200	60,000	36,200	34,100	62,700	23,500	41,600	22,400	14,800	38,900
6	13,800	12,400	10,200	49,100	40,200	32,800	54,500	23,500	34,800	20,700	15,800	38,200
7	11,900	11,900	10,600	40,200	41,600	31,500	49,100	22,900	30,800	21,200	18,500	45,000
8	10,600	11,900	11,000	35,500	43,000	30,200	49,100	22,400	28,300	21,200	16,300	44,300
9	10,200	11,400	12,400	33,400	45,000	28,300	49,100	22,900	25,900	20,700	15,800	59,300
10	9,750	11,400	17,900	44,300	50,400	27,700	68,800	25,300	24,700	20,700	14,800	57,900
11	9,750	11,900	21,800	63,400	57,900	30,800	128,000	27,700	24,700	19,600	14,300	55,900
12	9,350	11,900	20,100	68,100	68,100	31,500	146,000	28,300	23,500	19,000	16,300	55,200
13	9,350	12,800	20,100	70,200	70,200	34,100	119,000	28,900	22,400	21,200	16,900	70,200
14	8,960	13,300	22,900	83,800	64,000	28,900	88,500	27,700	22,400	20,700	15,800	65,400
15	8,580	12,400	21,800	92,600	58,600	32,800	70,200	27,700	22,900	20,700	15,800	60,000
16	8,580	11,900	20,100	83,100	55,200	32,100	58,600	27,100	22,400	19,600	16,300	34,800
17	8,580	11,400	19,600	95,300	51,100	30,200	51,100	25,300	22,400	17,400	15,300	52,500
18	8,960	11,400	22,900	140,000	45,000	28,900	45,700	24,700	21,800	17,400	12,800	70,800
19	8,960	11,400	21,800	169,000	40,200	27,700	43,000	27,100	21,200	16,900	11,900	72,200
20	9,350	11,000	21,800	163,000	37,500	27,100	40,900	28,300	20,700	19,600	11,900	66,800
21	9,750	11,000	21,200	131,000	38,900	29,600	37,500	28,300	20,100	15,800	12,800	55,200
22	10,200	10,200	21,200	93,300	38,900	32,800	34,800	28,900	20,100	16,900	15,300	44,300
23	10,200	9,750	20,100	68,800	37,500	37,500	33,400	28,300	20,700	16,900	27,700	38,900
24	10,600	9,750	19,000	56,600	36,800	38,900	32,100	47,000	20,100	16,900	36,200	45,700
25	11,900	9,350	21,800	47,000	57,900	43,000	30,800	59,300	19,000	13,800	28,300	42,300
26	15,300	9,350	20,100	44,300	70,200	72,900	28,900	59,300	20,100	14,800	23,500	38,200
27	21,800	9,350	20,700	41,600	69,500	148,000	28,300	53,800	15,800	11,900	19,000	31,500
28	26,500	10,200	22,900	38,900	61,300	147,000	27,100	44,300	21,800	11,400	16,900	27,700
29	24,100	10,200	27,700	35,500	53,800	129,000	26,500	45,700	40,200	11,000	17,900	25,300
30	21,800	10,200	31,500	34,100	.....	161,000	25,900	47,000	45,000	11,900	13,800	22,400
31	19,000	.....	30,800	32,100	.....	178,000	.....	49,100	.....	11,900	14,800	.....

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Daily discharge, in second-feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1889.												
1	21,200	51,100	31,500	31,500	93,300	46,400	26,500	25,900	45,700	28,300	45,700	23,500
2	19,600	38,200	30,200	33,400	85,800	43,000	28,900	24,700	48,400	29,600	50,400	22,400
3	19,000	41,300	28,900	32,100	81,000	40,900	31,500	25,300	78,300	32,100	60,000	21,200
4	18,500	42,300	27,700	36,200	72,900	40,900	30,800	25,900	70,200	34,800	62,700	21,800
5	17,400	39,600	26,500	36,800	65,400	45,700	28,900	25,300	47,000	40,200	62,700	22,400
6	22,400	37,500	25,300	51,800	60,600	47,000	27,700	27,700	43,600	49,800	57,200	36,200
7	17,900	34,100	24,700	57,900	54,500	43,600	25,900	28,300	32,100	48,400	56,600	40,900
8	15,800	30,800	23,500	64,700	45,700	40,200	22,900	25,900	28,900	41,600	52,500	32,800
9	25,900	33,400	22,400	70,800	45,000	36,800	21,800	23,500	26,500	34,100	44,300	25,900
10	30,200	86,500	24,100	77,000	49,100	33,400	20,100	21,800	25,300	29,600	39,600	22,900
11	32,800	136,000	25,300	78,300	53,800	30,800	18,500	20,700	24,700	25,900	32,800	22,400
12	33,400	137,000	26,500	74,200	53,200	27,700	18,500	20,100	23,500	22,400	28,900	20,700
13	34,800	120,000	27,700	68,100	48,400	25,300	17,900	19,000	28,300	22,400	28,300	20,100
14	23,500	113,000	28,900	55,900	40,200	22,400	21,800	18,500	33,400	21,200	32,100	17,900
15	31,500	116,000	32,100	49,100	36,200	20,700	25,900	17,900	43,000	23,500	32,100	16,900
16	32,800	101,000	28,900	45,000	38,900	18,500	32,100	19,000	62,000	28,900	38,900	15,300
17	30,200	98,700	23,500	47,700	130,000	17,900	37,500	18,500	66,100	30,200	44,300	13,800
18	27,100	96,000	24,100	54,500	195,000	19,600	44,300	19,000	64,700	34,800	38,200	45,700
19	24,700	103,000	25,300	59,300	193,000	31,100	47,700	21,200	66,800	33,400	37,500	48,400
20	23,500	107,000	27,100	66,100	179,000	43,600	49,800	20,100	64,000	29,600	32,100	43,000
21	22,400	67,400	31,500	70,800	191,000	54,500	49,100	19,000	55,200	25,900	27,700	37,500
22	23,500	62,000	38,900	75,600	178,000	58,600	47,000	17,900	49,800	24,700	24,700	27,100
23	27,700	52,500	40,900	77,600	137,000	57,200	43,000	16,900	44,300	22,400	22,900	24,100
24	29,600	47,700	35,500	77,000	103,000	53,200	32,100	15,800	37,500	21,200	21,200	27,100
25	45,700	43,000	32,800	60,600	62,700	48,400	22,900	15,800	32,100	20,100	24,100	44,300
26	66,800	41,600	28,900	51,800	51,800	44,300	22,400	15,300	27,100	19,600	24,100	44,300
27	85,100	38,900	25,900	56,600	50,400	40,900	22,400	15,300	22,400	20,100	25,300	39,600
28	130,000	35,500	23,500	63,400	48,400	38,200	21,800	15,300	22,400	27,100	25,300	40,200
29	120,000	34,100	26,500	72,900	.....	33,400	22,900	15,800	21,800	45,000	23,500	37,500
30	99,400	32,800	26,500	82,400	.....	28,900	24,700	16,900	29,600	55,200	22,900	31,500
31	72,200	.....	25,300	89,200	.....	25,900	.....	19,600	.....	56,600	24,100	.....
1890.												
1	27,100	15,300	46,400	27,700	48,400	267,000	62,000	45,000	35,500	17,900	33,400	45,700
2	25,300	15,300	45,700	29,600	43,600	283,000	60,600	42,300	32,100	16,300	29,600	32,100
3	24,100	15,800	44,300	28,900	43,600	273,000	57,900	39,600	30,200	16,300	26,500	32,800
4	21,800	26,500	38,900	28,300	44,300	228,000	60,000	40,200	30,200	16,900	26,500	22,400
5	20,100	24,100	34,800	28,300	43,000	150,000	77,000	41,800	29,600	16,900	27,100	20,100
6	18,500	30,800	32,100	27,100	47,000	96,700	89,200	45,000	30,200	16,900	25,300	17,900
7	17,400	27,100	30,800	26,500	50,400	90,600	86,500	54,500	29,600	16,900	29,600	20,100
8	15,800	27,100	29,600	25,900	72,200	91,900	85,100	55,900	27,700	16,300	32,800	17,900
9	15,300	38,900	28,300	26,500	125,000	81,000	74,900	53,200	26,500	15,800	38,900	15,800
10	14,800	54,500	27,700	27,700	133,000	70,200	65,400	53,200	25,300	15,300	45,000	15,800
11	14,300	70,800	26,500	26,500	115,000	62,000	59,300	49,100	25,300	15,300	43,000	16,900
12	13,800	62,000	25,900	25,900	94,000	56,600	53,200	46,400	24,700	16,900	36,800	19,000
13	13,800	53,200	24,700	25,900	75,600	52,500	48,400	43,000	22,400	15,300	33,400	20,100
14	13,300	55,900	24,100	27,700	62,000	53,200	45,000	39,600	21,800	14,300	29,600	25,900
15	12,800	58,600	23,500	25,900	60,600	60,000	42,300	38,900	22,400	13,300	27,100	22,400
16	12,800	53,200	22,400	30,800	59,300	87,200	40,900	47,000	22,900	12,400	23,500	22,400
17	13,300	51,800	21,800	43,000	55,200	96,700	42,300	57,200	22,400	11,900	21,200	20,700
18	13,300	64,000	21,200	56,600	57,200	95,300	57,900	52,500	21,800	17,900	20,700	22,400
19	13,300	65,400	20,700	49,800	51,800	82,400	107,000	47,700	20,700	26,500	18,500	30,200
20	12,800	68,100	20,100	45,000	47,000	73,600	133,000	53,800	20,100	26,500	17,400	20,700
21	12,800	70,800	20,100	41,600	43,600	78,300	118,000	66,800	20,700	22,900	14,800	20,700
22	12,400	61,300	19,600	59,300	42,300	89,200	91,200	74,900	21,200	19,600	14,300	33,400
23	12,800	58,600	19,600	82,400	43,000	130,000	70,800	74,900	20,700	17,900	21,200	19,600
24	12,400	64,000	21,200	77,600	44,300	167,000	59,300	72,900	21,200	17,900	22,400	18,500
25	12,800	62,000	22,400	73,600	76,300	179,000	53,200	56,600	22,400	22,900	18,500	19,000
26	13,300	58,600	22,400	62,000	121,000	171,000	51,100	47,000	22,400	34,100	21,200	22,400
27	13,800	48,400	21,200	50,400	173,000	140,000	51,100	44,300	21,800	45,000	20,100	24,100
28	13,800	44,300	20,700	43,600	231,000	98,700	51,800	48,400	21,800	46,400	16,900	22,400
29	13,800	44,300	20,100	38,900	.....	82,400	51,100	49,100	19,600	41,600	21,200	21,200
30	14,800	47,700	24,700	46,400	.....	74,900	49,100	44,300	17,400	36,800	30,800	30,200
31	15,800	.....	27,100	50,400	.....	66,800	.....	40,200	.....	36,200	38,200	.....

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Daily discharge, in second-feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1891.												
1	57,900	40,200	13,800	46,400	60,600	120,000	98,700	34,100	33,500	21,800	50,400	30,800
2	49,100	38,900	13,800	47,000	83,800	113,000	105,000	32,800	32,100	21,200	64,000	26,500
3	46,400	32,800	13,300	61,300	103,000	100,000	105,000	32,100	30,200	20,100	96,700	24,100
4	43,000	30,200	13,300	89,900	129,000	84,400	101,000	31,500	27,100	20,100	106,000	23,500
5	37,500	28,300	13,300	99,400	148,000	98,700	96,700	29,600	24,700	20,100	75,600	28,900
6	32,800	25,900	14,300	97,400	141,000	130,000	79,700	28,900	22,900	20,100	53,200	28,900
7	29,600	24,700	15,800	64,700	118,000	154,000	72,900	27,700	21,800	19,000	40,900	29,600
8	29,600	24,100	16,300	49,800	109,000	192,000	67,400	26,500	22,900	17,900	33,500	29,600
9	31,500	22,400	42,300	42,300	92,600	229,000	60,600	25,900	25,900	18,500	28,900	33,500
10	30,200	21,800	49,100	36,800	137,000	249,000	59,300	25,300	26,500	25,300	25,900	27,700
11	27,100	21,200	49,800	38,200	183,000	259,000	60,600	24,700	31,500	28,900	24,700	24,700
12	25,900	20,100	46,400	54,500	227,000	250,000	61,300	24,100	41,600	24,700	22,400	21,800
13	24,700	19,600	44,300	66,800	242,000	222,000	66,100	23,500	38,200	21,800	22,400	20,100
14	23,500	19,000	37,500	62,000	249,000	178,000	70,800	22,900	32,800	19,600	21,800	19,600
15	21,800	18,500	20,700	56,600	235,000	145,000	77,000	23,500	31,500	17,400	21,200	19,600
16	20,700	17,900	23,500	43,600	191,000	129,000	67,400	23,500	32,800	16,300	20,100	19,600
17	20,700	17,900	21,800	47,000	137,000	117,000	57,900	25,300	33,500	15,800	19,600	19,600
18	20,700	16,900	21,800	45,000	128,000	98,000	51,100	26,500	35,500	15,300	19,000	17,900
19	23,500	17,900	22,400	45,000	118,000	85,800	49,800	26,500	40,200	22,900	16,900	16,300
20	22,400	17,400	22,400	45,700	106,000	77,600	47,700	25,900	43,600	28,300	16,900	15,300
21	22,400	17,400	21,800	43,600	99,400	70,800	47,700	25,300	40,200	25,300	19,000	14,800
22	21,200	17,400	21,800	49,800	122,000	67,400	45,700	24,100	40,200	22,400	22,400	14,300
23	30,200	16,300	21,800	79,000	157,000	66,800	44,300	22,900	38,200	21,200	25,900	13,800
24	43,000	15,800	21,800	98,000	182,000	67,400	44,300	22,400	42,300	20,100	31,500	13,300
25	53,800	15,800	24,100	89,200	191,000	66,100	45,000	21,200	44,300	19,600	32,100	12,800
26	56,600	15,300	25,900	86,500	176,000	64,700	45,000	21,800	45,700	19,600	46,400	12,800
27	58,600	14,800	57,900	70,200	134,000	65,400	44,300	22,400	36,200	19,600	49,800	12,400
28	52,500	14,800	79,000	60,000	123,000	89,900	43,000	22,900	27,700	20,100	49,100	11,900
29	45,700	14,300	81,700	47,700	.....	86,500	38,200	22,900	24,100	20,100	41,600	11,500
30	42,300	13,800	78,300	47,700	.....	82,400	36,200	26,500	22,900	21,200	37,500	11,500
31	41,600	.....	57,200	54,500	.....	83,100	.....	30,200	.....	32,800	35,500	.....
1892.												
1	11,000	8,960	20,700	38,900	38,200	32,800	55,900	53,200	32,100	38,900	23,500	12,400
2	11,500	8,960	17,900	38,900	36,200	32,100	50,400	49,800	30,800	32,100	22,900	11,000
3	11,500	8,960	16,300	49,100	34,800	31,500	44,300	45,700	31,500	31,500	23,500	10,600
4	11,000	8,580	15,800	53,800	33,500	30,200	40,200	43,600	33,500	30,800	22,400	9,750
5	11,000	8,580	32,100	53,200	31,500	28,900	38,200	44,300	53,800	38,900	22,900	8,960
6	10,600	8,580	35,500	51,100	30,800	28,300	51,800	41,600	56,600	54,500	27,700	12,800
7	10,600	8,580	38,900	55,200	30,200	27,700	142,000	38,900	57,200	70,200	23,500	12,400
8	10,200	8,580	52,500	60,600	33,500	28,300	209,000	36,800	53,200	74,200	21,200	11,900
9	10,600	8,580	67,400	62,000	49,100	34,800	227,000	36,200	52,500	62,700	19,600	11,900
10	10,600	8,580	68,100	57,200	72,200	42,300	227,000	34,100	50,400	52,500	18,500	11,500
11	11,000	9,750	63,400	49,100	70,800	48,400	205,000	31,500	47,000	55,200	18,500	11,900
12	11,000	10,600	51,800	50,400	65,400	47,700	175,000	32,800	48,400	58,600	17,400	11,000
13	10,600	15,300	40,200	70,200	54,500	45,700	116,000	32,800	49,100	57,900	19,600	12,400
14	10,600	20,100	32,800	150,000	46,400	45,700	81,700	31,500	47,000	54,500	20,100	12,400
15	10,600	22,900	28,900	218,000	43,000	40,200	73,600	30,200	34,800	53,200	20,700	12,400
16	10,200	19,600	28,300	246,000	44,300	36,200	68,100	29,600	30,200	51,800	19,600	17,400
17	10,200	15,800	29,600	252,000	48,400	34,100	62,000	28,900	27,100	51,100	17,400	25,300
18	9,750	14,300	30,200	233,000	47,700	38,200	57,900	27,100	24,700	49,100	16,300	22,900
19	9,750	13,800	27,100	173,000	45,000	45,000	53,800	28,900	24,700	45,000	15,800	19,600
20	9,750	14,300	25,300	121,000	46,400	49,800	77,600	31,500	24,100	43,000	15,800	16,900
21	9,750	13,300	23,500	123,000	47,700	49,800	104,000	35,500	41,600	40,900	16,900	15,800
22	9,750	13,800	22,400	123,000	54,500	47,000	105,000	38,200	47,000	36,200	16,300	16,900
23	9,750	16,900	21,200	112,000	54,500	45,700	99,400	40,900	44,300	32,100	16,300	14,800
24	9,750	25,900	20,700	95,300	53,200	51,100	94,600	42,300	42,300	30,800	16,900	13,300
25	9,750	36,200	22,900	77,000	47,700	59,300	85,800	45,700	40,900	29,600	15,300	13,300
26	9,750	39,600	27,700	65,400	45,000	58,600	87,200	47,000	40,200	28,300	15,800	20,100
27	9,750	36,800	49,100	60,000	39,600	62,000	86,500	39,600	39,600	25,900	17,900	20,100
28	9,750	32,100	63,400	51,800	37,500	66,100	64,700	36,200	43,600	25,300	20,100	17,400
29	9,350	26,500	59,300	46,400	34,100	64,000	55,900	33,500	45,000	24,100	24,700	14,800
30	9,350	22,400	51,100	40,900	.....	60,000	53,800	32,800	43,000	22,900	21,200	13,800
31	9,350	.....	47,000	40,200	.....	57,900	.....	32,100	.....	21,200	18,500	.....

48520°—W S P 353—15——9

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Daily discharge, in second-feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1893.												
1	12,800	8,210	22,900	19,000	64,700	51,100	31,500	63,400	44,300	21,800	14,800	51,100
2	11,900	8,580	22,400	19,000	76,300	55,900	30,200	59,300	48,400	21,200	14,300	40,200
3	11,500	8,580	21,200	26,500	66,100	54,500	28,900	68,800	62,000	23,500	17,400	28,300
4	11,000	10,200	20,700	32,800	52,500	54,500	28,900	119,000	49,100	29,600	19,600	36,200
5	10,600	11,900	20,100	32,100	48,400	53,200	28,900	161,000	38,900	27,100	18,500	34,800
6	10,200	13,300	20,100	30,200	46,400	55,200	29,600	186,000	50,400	21,800	17,900	27,700
7	10,200	13,800	18,500	29,600	41,600	55,900	30,800	198,000	103,000	21,200	27,700	24,100
8	9,750	13,800	17,900	26,500	38,200	53,800	30,800	186,000	135,000	19,600	28,300	19,600
9	9,750	16,300	17,900	22,400	35,500	53,800	28,900	116,000	124,000	19,000	22,900	17,900
10	9,750	24,700	16,900	21,200	36,200	57,900	28,900	81,000	97,400	20,100	21,200	15,800
11	9,750	34,100	16,300	19,000	51,800	69,500	28,900	73,600	74,200	19,000	18,500	15,800
12	9,750	38,900	15,300	16,300	94,000	73,600	28,300	64,700	54,500	19,000	16,900	20,700
13	9,350	41,600	14,800	16,300	142,000	72,200	27,100	57,900	43,600	18,500	15,300	33,500
14	9,350	24,700	14,800	16,300	154,000	75,600	63,400	53,800	40,200	17,900	14,300	68,100
15	9,350	23,500	18,500	16,300	148,000	66,100	76,300	49,100	38,200	16,900	15,800	80,400
16	9,350	27,100	19,000	16,300	139,000	58,600	64,700	47,000	36,200	15,800	16,300	59,300
17	9,350	32,100	30,200	16,300	154,000	51,100	52,500	57,900	32,100	15,300	21,200	48,400
18	8,960	36,200	49,100	16,300	194,000	45,700	44,300	64,700	30,800	15,800	29,600	41,600
19	8,960	37,500	53,200	16,300	214,000	41,600	38,200	54,500	30,200	16,900	27,700	35,500
20	8,580	36,200	51,100	16,300	221,000	39,600	37,500	46,400	29,600	17,900	22,400	28,900
21	8,580	31,500	55,900	16,300	217,000	36,800	43,000	44,300	30,800	19,600	16,300	23,500
22	8,580	27,100	57,200	16,300	188,000	34,800	43,000	39,600	32,100	20,100	14,800	20,100
23	8,580	24,700	54,500	16,300	118,000	33,500	42,300	35,500	32,800	25,900	13,800	19,000
24	8,580	23,500	47,000	17,400	77,600	32,800	40,200	32,800	30,800	29,600	13,300	17,900
25	8,580	21,800	39,600	17,400	64,700	37,500	39,600	30,800	34,100	31,500	12,800	16,900
26	8,210	19,000	33,500	19,000	57,200	40,200	34,800	29,600	32,100	20,700	11,500	16,300
27	8,210	17,400	29,600	20,700	51,100	40,200	32,800	28,300	29,600	19,000	11,000	15,300
28	8,210	16,900	27,100	21,200	49,800	36,800	41,600	25,900	28,900	16,300	10,200	14,800
29	8,210	16,900	24,100	24,700	.....	34,100	58,600	30,800	26,500	15,300	10,200	13,800
30	8,210	20,100	21,800	30,200	.....	33,500	64,700	38,200	22,900	14,800	10,600	14,300
31	8,210	.....	18,500	42,300	.....	32,800	.....	44,300	.....	14,800	10,200	.....
1894.												
1	14,800	17,400	14,300	16,300	28,900	46,400	28,300	21,800	21,200	24,700	16,300	22,400
2	14,300	16,900	21,800	19,000	28,300	49,800	27,100	21,200	20,100	22,400	16,300	21,200
3	13,800	15,800	20,700	21,200	27,700	57,900	30,800	20,700	19,600	20,700	16,300	16,900
4	13,800	15,300	22,900	21,800	31,500	60,000	30,200	20,700	19,000	24,700	15,800	14,800
5	14,800	14,800	24,100	19,600	143,000	58,600	40,200	20,100	18,500	23,500	16,300	12,400
6	14,300	14,300	26,500	17,400	167,000	57,200	40,900	19,600	17,900	20,700	16,900	11,900
7	16,300	13,800	26,500	27,700	157,000	51,800	43,000	19,000	16,300	17,900	16,300	11,000
8	17,400	13,800	25,300	35,500	128,000	49,800	44,300	18,500	15,800	18,500	16,300	10,600
9	16,300	13,300	22,900	58,600	103,000	47,700	38,900	19,000	14,800	17,400	16,900	9,750
10	16,300	13,800	22,400	55,200	103,000	43,000	32,800	18,500	14,300	18,500	14,800	9,350
11	14,800	14,300	20,700	51,800	108,000	40,900	34,100	17,900	14,300	20,700	13,300	9,350
12	14,300	27,100	17,900	47,700	98,700	38,900	43,000	26,500	13,800	18,500	12,400	9,350
13	13,800	21,200	17,400	50,400	97,400	39,600	51,800	28,900	13,300	15,300	11,500	8,960
14	14,300	20,100	16,900	48,400	89,900	43,000	47,000	27,100	13,300	13,800	11,000	8,580
15	11,900	19,600	16,300	47,000	77,000	41,600	43,000	24,100	12,800	12,400	11,900	9,750
16	10,600	16,900	16,900	47,000	64,000	40,900	39,600	22,400	12,400	11,500	20,100	11,000
17	59,300	15,800	17,900	42,300	58,600	40,200	36,800	22,900	11,900	11,000	25,900	11,000
18	37,500	15,300	19,600	43,000	52,500	43,600	31,500	29,600	12,400	15,800	19,600	11,900
19	32,800	14,300	21,200	36,800	51,100	44,300	28,300	28,300	13,800	13,800	16,900	11,900
20	29,600	14,800	21,800	34,800	50,400	46,400	28,900	30,800	14,300	13,800	17,400	10,200
21	22,900	14,800	21,800	30,200	51,800	42,300	27,700	32,100	14,800	18,500	20,100	9,750
22	19,000	14,800	19,600	28,300	53,200	53,800	27,100	36,200	14,300	20,700	20,700	9,750
23	17,400	14,300	18,500	28,300	53,800	53,200	26,500	40,200	13,300	21,200	22,400	11,000
24	15,800	14,300	17,400	29,600	49,800	49,100	25,900	40,900	12,800	19,000	20,100	11,000
25	17,400	13,800	16,300	30,200	47,700	46,400	25,300	42,300	12,800	22,400	16,900	10,200
26	18,500	14,300	15,800	29,600	41,600	43,600	24,100	39,600	14,300	22,900	14,800	8,960
27	27,700	14,800	15,300	30,800	46,400	41,600	23,500	34,800	14,800	21,800	12,800	8,210
28	25,900	15,800	14,800	30,800	46,400	38,200	22,900	32,100	15,300	21,200	15,300	7,850
29	22,400	15,300	14,300	28,900	.....	34,100	22,400	28,900	16,300	20,100	13,800	7,500
30	19,600	14,300	15,300	28,300	.....	32,800	22,400	26,500	24,100	18,500	15,300	7,160
31	17,900	.....	17,400	27,700	.....	29,600	.....	23,500	.....	18,500	24,100	.....

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Daily discharge, in second-feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1895.												
1	7,500	9,350	7,850	26,500	45,700	40,200	47,000	34,800	32,100	17,900	24,700	18,500
2	7,500	10,600	7,850	21,800	43,000	43,600	44,300	33,500	29,600	19,000	22,900	19,000
3	7,850	13,300	7,500	18,500	43,600	76,300	40,200	31,500	27,100	21,200	21,200	17,900
4	9,750	10,200	7,500	17,900	45,000	118,000	38,200	30,800	25,300	22,400	19,600	17,400
5	11,000	9,350	7,500	17,400	45,700	129,000	36,800	32,800	23,500	25,300	19,000	16,300
6	11,000	9,750	7,500	17,400	44,300	118,000	36,200	34,800	24,700	28,300	16,900	15,800
7	9,750	9,750	7,500	18,500	40,900	85,100	34,800	38,200	25,900	28,300	17,900	15,800
8	8,960	8,960	7,500	22,400	38,200	65,400	59,300	41,600	29,600	28,900	18,500	15,800
9	8,210	8,580	8,210	68,100	37,500	56,600	66,800	49,800	28,900	31,500	18,500	14,300
10	7,850	8,210	8,580	133,000	28,300	52,500	71,500	52,500	25,900	32,800	16,900	13,800
11	7,160	7,850	10,200	188,000	22,400	49,100	82,400	55,200	23,500	28,900	16,900	13,300
12	7,500	7,850	21,200	212,000	18,500	45,000	79,000	53,800	21,200	24,700	16,300	13,800
13	8,580	7,500	52,500	206,000	23,500	47,000	64,700	54,500	20,100	21,200	17,900	14,300
14	11,500	7,160	69,500	186,000	23,800	48,400	53,800	58,600	19,600	19,000	16,300	14,300
15	13,800	7,160	70,200	127,000	24,100	53,200	47,700	55,200	19,000	17,900	15,800	13,300
16	12,400	7,160	67,400	77,600	26,500	57,900	44,300	49,800	19,000	17,900	15,300	12,800
17	10,600	7,160	52,500	68,100	26,500	56,600	41,600	46,400	21,200	20,700	17,400	12,400
18	9,350	6,830	38,900	62,000	23,500	59,300	55,200	42,300	20,700	20,100	24,100	13,300
19	8,210	7,160	26,500	60,000	26,500	57,900	74,200	41,600	19,600	18,500	27,700	12,800
20	7,850	7,500	23,500	55,900	25,900	54,500	74,200	43,000	17,900	16,900	32,800	11,900
21	7,500	7,500	20,100	59,300	28,900	91,200	61,300	42,300	17,400	15,300	30,200	12,400
22	7,160	7,500	17,900	63,400	32,100	134,000	52,500	39,600	17,900	15,300	35,500	11,500
23	7,160	7,850	15,800	61,300	35,500	148,000	46,400	36,200	17,400	14,300	30,200	10,200
24	7,160	7,850	15,300	55,900	39,600	144,000	42,300	33,500	16,900	13,800	27,100	9,350
25	7,160	8,210	14,300	67,400	40,200	118,000	39,600	32,100	16,300	13,800	25,900	8,960
26	7,160	8,580	13,800	67,400	38,200	82,400	36,800	32,100	16,300	16,300	26,500	8,960
27	6,830	8,580	23,500	62,000	36,800	70,800	34,800	41,600	14,800	21,200	23,500	8,580
28	6,830	8,580	40,900	57,200	36,800	66,100	34,800	45,000	14,300	63,400	20,700	8,210
29	6,830	8,210	51,100	53,800	.....	58,600	34,100	44,300	14,300	64,700	19,600	7,850
30	7,850	8,210	47,700	52,500	.....	54,500	34,100	39,600	14,800	44,300	20,700	7,500
31	8,210	.....	33,500	51,100	.....	51,100	.....	34,800	.....	30,200	19,000	.....
1896.												
1	7,500	8,210	9,350	27,700	24,700	22,900	94,600	19,000	14,800	18,500	31,500	13,800
2	7,160	8,580	9,750	28,300	36,200	21,800	182,000	19,000	16,900	17,900	29,600	12,400
3	7,160	8,960	9,350	27,700	62,000	21,200	228,000	19,000	24,700	17,400	27,100	11,500
4	7,160	10,200	9,350	27,700	72,900	20,700	258,000	19,600	32,800	17,900	25,900	11,000
5	7,160	10,200	9,350	26,500	65,400	20,100	269,000	22,400	29,500	17,900	25,300	10,200
6	7,160	8,960	10,200	24,100	57,200	19,600	245,000	25,900	26,500	17,900	27,700	10,200
7	7,160	8,960	9,750	20,100	74,200	19,000	152,000	25,900	22,900	20,100	28,300	9,750
8	7,500	8,580	9,350	18,500	89,200	19,600	72,900	24,100	19,600	28,300	23,500	11,900
9	7,160	8,210	8,960	17,900	87,800	19,600	55,200	22,400	19,600	47,700	21,200	15,800
10	7,500	8,580	8,960	17,900	83,800	19,000	48,400	20,700	25,300	90,600	19,000	15,300
11	7,850	8,960	9,350	17,400	81,000	20,100	43,000	19,000	41,600	137,000	18,500	13,800
12	7,850	10,600	9,750	17,400	71,500	20,100	39,600	17,400	36,800	141,000	19,000	11,900
13	7,850	12,400	11,000	15,300	62,700	21,200	36,200	16,300	28,900	100,000	17,900	11,000
14	7,850	13,800	11,500	15,300	60,500	21,200	33,500	15,800	24,100	72,200	17,900	10,200
15	7,500	12,800	11,900	14,800	81,000	20,700	31,500	15,300	20,100	70,200	17,400	10,200
16	7,850	11,900	11,500	13,800	86,500	21,200	29,600	14,800	17,900	71,500	16,900	9,750
17	7,850	11,500	11,000	13,300	79,000	31,500	28,300	14,300	16,900	68,800	16,900	8,960
18	7,850	11,000	10,600	13,300	68,800	62,700	27,100	13,800	15,800	88,500	16,300	9,350
19	7,500	10,600	10,200	13,300	55,200	83,100	25,900	13,800	16,300	79,000	15,300	9,350
20	7,500	9,750	9,750	13,300	45,700	101,000	24,700	12,800	17,400	59,300	14,800	8,960
21	7,160	8,960	10,200	13,300	39,600	87,800	23,500	12,400	20,700	45,700	13,800	8,580
22	7,160	8,210	12,400	14,300	34,800	70,200	22,900	12,400	19,600	38,200	13,800	8,580
23	6,830	8,960	18,500	17,400	30,800	58,600	22,900	14,300	19,600	51,800	12,800	8,960
24	6,830	9,350	23,500	28,300	27,700	51,100	22,400	17,900	18,500	51,800	12,800	9,350
25	6,830	8,960	25,900	38,200	26,500	47,700	22,400	20,100	17,400	52,500	15,800	10,200
26	6,830	8,960	24,100	49,800	25,900	45,000	21,200	21,200	16,300	47,000	14,800	11,900
27	6,830	8,960	23,500	48,400	25,300	43,000	20,700	17,900	14,800	69,500	15,300	10,600
28	6,830	8,960	25,300	41,600	24,700	39,600	21,200	17,400	14,800	77,000	17,900	9,750
29	6,830	8,960	29,600	34,800	23,800	36,200	21,200	15,800	15,800	57,200	22,400	9,750
30	6,830	9,750	26,500	30,200	.....	33,500	20,100	15,300	16,900	43,000	20,100	15,300
31	7,850	.....	26,500	27,100	.....	46,400	.....	14,300	.....	36,200	15,800	.....

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Daily discharge, in second-feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1915—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1897.												
1	14,300	8,580	70,200	13,800	16,900	79,000	53,200	34,100	24,100	27,700	24,700	12,400
2	13,300	8,580	86,500	14,300	41,600	59,300	77,000	36,800	23,500	24,700	21,200	12,800
3	14,800	8,960	88,500	14,300	62,700	52,500	96,000	44,300	23,500	21,200	21,200	11,000
4	16,900	9,750	69,500	14,800	65,400	55,200	103,000	59,300	22,900	19,000	20,100	11,000
5	15,300	9,750	49,800	14,800	57,900	58,600	171,000	59,300	22,900	20,100	18,500	11,000
6	14,800	10,200	38,200	15,300	50,400	76,300	201,000	51,800	22,900	22,400	19,000	10,600
7	12,400	13,300	32,100	16,300	53,800	125,000	196,000	46,400	22,400	21,200	23,500	10,600
8	10,600	19,600	27,700	16,900	66,800	165,000	167,000	43,000	24,700	22,400	23,500	10,200
9	9,750	23,500	25,900	15,800	89,900	159,000	130,000	38,900	24,100	24,100	27,100	10,200
10	9,350	22,900	24,700	15,800	99,000	139,000	103,000	36,200	22,900	22,400	31,500	9,350
11	8,580	18,500	25,300	15,300	83,800	146,000	89,900	34,800	32,100	23,500	28,900	8,580
12	8,580	17,900	26,500	14,800	67,400	187,000	79,700	36,200	33,400	26,500	24,700	8,580
13	8,580	33,500	24,700	13,800	61,300	231,000	71,500	47,000	27,700	25,300	22,400	8,580
14	8,580	43,600	25,300	14,800	62,000	252,000	64,000	119,000	23,500	22,900	19,000	7,850
15	9,750	38,200	24,700	22,900	65,400	252,000	60,000	146,000	21,200	21,200	16,900	7,850
16	10,600	31,500	22,900	38,200	66,800	246,000	60,600	132,000	20,100	20,700	15,800	7,850
17	10,200	27,700	21,800	38,900	60,600	239,000	63,400	106,000	20,100	27,100	15,800	7,500
18	10,200	24,100	21,200	36,800	52,500	224,000	60,600	74,900	20,100	38,200	17,900	7,500
19	10,600	21,200	23,500	37,500	45,700	195,000	57,200	55,900	18,500	33,400	18,500	7,160
20	10,200	19,000	27,100	40,200	41,600	195,000	53,800	46,400	19,000	34,100	16,900	7,160
21	10,200	16,900	25,900	41,600	41,600	214,000	49,100	40,900	25,300	38,900	16,900	7,500
22	9,350	15,800	24,100	43,000	50,400	220,000	45,000	37,500	27,700	34,800	19,000	7,160
23	8,580	14,300	22,400	43,600	83,800	204,000	41,600	34,100	28,300	33,400	19,000	7,160
24	8,580	13,800	21,200	41,600	165,000	164,000	39,600	32,100	30,200	37,500	21,200	7,500
25	8,580	13,300	20,100	38,900	209,000	117,000	37,500	32,100	32,800	52,500	17,900	7,160
26	8,580	12,800	18,500	34,100	231,000	91,000	36,200	28,300	35,500	70,200	15,800	7,160
27	8,580	12,400	17,400	30,200	224,000	77,000	34,800	27,100	29,600	77,000	15,800	6,830
28	8,580	12,800	16,300	27,100	154,000	67,400	35,500	25,900	34,800	49,800	15,800	6,830
29	8,210	30,200	15,300	24,700	.....	60,600	36,200	24,700	34,800	37,500	13,800	6,830
30	8,210	57,900	14,800	20,700	.....	55,900	33,500	23,500	35,500	31,500	12,800	7,160
31	8,960	.....	14,300	16,900	.....	52,500	.....	24,100	.....	27,100	12,400	.....
1898.												
1	7,160	7,160	7,850	19,000	45,700	18,500	112,000	37,500	19,000	13,800	49,800	20,100
2	7,160	7,500	8,960	17,900	39,600	17,900	115,000	33,400	18,500	13,800	45,700	22,400
3	6,830	8,210	9,350	16,900	36,200	16,900	96,000	30,800	18,500	12,800	37,500	56,600
4	6,510	8,580	12,800	16,300	30,800	16,900	71,500	28,300	18,500	11,900	30,800	120,000
5	6,200	8,580	19,600	15,800	28,300	18,500	64,700	26,500	15,800	13,800	36,200	164,000
6	6,200	8,580	21,200	14,800	25,900	19,000	77,000	24,700	14,800	12,400	74,200	145,000
7	5,900	8,960	21,800	15,300	24,700	19,600	72,900	24,700	13,800	12,400	93,300	101,000
8	5,900	8,960	19,000	15,800	24,700	19,000	64,000	22,900	12,800	12,800	79,700	70,200
9	5,900	8,580	15,800	16,900	24,100	17,900	57,200	23,500	11,900	14,800	63,400	58,600
10	5,900	8,580	13,800	17,900	23,500	16,900	50,400	23,500	11,900	16,900	51,800	52,500
11	6,200	8,210	13,800	17,900	22,400	16,300	52,500	24,700	11,000	19,600	55,200	44,300
12	6,510	7,850	11,900	31,500	21,800	15,800	58,600	25,900	11,900	19,000	77,600	37,500
13	7,850	7,850	11,000	83,800	21,200	15,800	57,900	24,700	11,000	17,900	94,600	32,800
14	9,350	7,500	11,000	91,900	21,200	15,800	55,200	23,500	11,000	15,800	101,000	29,600
15	8,580	7,160	14,800	77,000	21,200	17,900	55,200	22,400	10,200	15,800	96,000	27,100
16	8,580	7,160	15,300	77,000	20,700	28,900	56,600	21,800	11,000	19,600	72,900	24,700
17	8,580	7,160	13,800	78,300	20,100	28,300	52,500	21,200	11,900	25,900	54,500	23,500
18	8,580	7,160	14,800	62,000	19,500	29,600	49,800	20,700	13,800	30,800	42,300	22,400
19	8,580	7,160	15,300	56,600	18,500	31,500	48,400	20,700	19,600	25,900	37,500	21,200
20	10,200	7,160	20,100	73,600	18,500	35,500	48,400	20,100	22,400	23,500	34,800	20,100
21	11,900	6,830	27,700	87,800	17,900	32,800	44,300	20,100	30,800	22,400	22,400	19,000
22	11,000	6,830	48,400	85,100	17,900	30,800	41,600	20,100	32,100	18,500	32,100	20,100
23	9,750	6,830	63,400	79,700	19,000	29,600	38,900	19,600	28,300	18,500	30,800	28,300
24	9,350	6,830	53,800	78,300	19,600	25,900	40,200	19,000	25,900	19,000	27,100	28,300
25	10,200	6,830	45,700	78,300	20,100	24,100	39,900	19,000	20,700	20,100	24,100	37,500
26	9,350	6,830	36,800	103,000	21,200	23,500	38,900	20,700	19,000	20,100	22,400	43,000
27	8,580	6,830	31,500	118,000	19,500	24,700	37,500	28,300	16,300	25,900	22,400	36,200
28	7,850	6,830	27,700	108,000	19,000	24,700	42,300	32,100	15,800	32,100	22,900	28,300
29	7,850	6,830	24,700	90,600	.....	25,900	41,600	27,700	15,800	30,800	24,100	24,100
30	7,160	6,830	22,400	70,600	.....	32,100	40,200	23,500	14,800	34,100	22,900	21,200
31	7,160	.....	21,200	55,200	.....	83,800	.....	20,700	.....	47,700	21,200	.....

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Daily discharge, in second-feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1899.												
1	20,100	25,900	28,900	27,100	32,800	125,000	149,000	45,700	23,500	19,000	23,500	12,800
2	18,500	24,100	28,300	28,300	32,100	114,000	127,000	42,300	23,500	18,500	20,100	13,800
3	17,900	23,500	27,700	30,200	32,100	97,400	95,300	39,600	24,700	16,900	16,900	15,800
4	21,900	22,400	28,300	33,400	66,800	90,600	82,400	36,800	27,100	15,800	15,800	16,900
5	54,500	21,800	28,300	34,800	151,000	116,000	83,800	36,200	25,900	14,800	13,800	14,800
6	109,000	21,800	32,100	43,000	201,000	161,000	94,000	42,300	23,500	14,800	13,800	12,800
7	106,000	23,500	34,800	122,000	227,000	175,000	101,000	51,800	22,400	14,800	13,800	11,900
8	67,400	24,700	34,100	119,000	246,000	182,000	116,000	57,900	21,200	16,900	13,800	11,000
9	53,800	25,300	33,400	112,000	254,000	182,000	115,000	62,000	20,100	16,300	12,800	10,200
10	51,100	24,700	32,100	111,000	244,000	104,000	101,000	66,800	19,000	14,800	12,400	11,000
11	45,700	25,900	28,900	87,900	200,000	74,200	90,600	70,200	21,800	14,800	12,400	10,600
12	38,900	28,300	27,100	65,400	126,000	66,100	81,700	64,700	24,100	13,800	11,900	11,900
13	34,800	30,200	25,900	56,600	77,000	59,300	72,900	59,300	29,600	13,300	11,900	11,000
14	32,800	28,300	24,100	49,100	58,600	70,200	66,800	57,200	33,400	12,800	12,800	11,900
15	30,800	25,900	22,400	45,700	51,800	161,000	62,000	59,300	37,500	12,800	14,800	11,000
16	27,700	24,700	21,200	43,600	45,700	227,000	57,900	56,600	35,500	11,900	14,800	10,200
17	26,500	25,900	20,700	44,300	48,400	245,000	53,800	53,200	37,500	11,400	13,800	9,350
18	29,600	27,100	20,100	44,300	59,300	240,000	51,100	47,000	36,200	11,000	13,300	9,350
19	30,600	28,300	21,200	43,000	70,800	237,000	48,400	40,900	29,600	11,400	12,800	8,580
20	47,000	30,200	29,600	41,600	79,700	246,000	45,700	37,500	26,500	11,900	11,400	7,850
21	57,200	33,400	33,400	40,200	72,200	261,000	44,300	34,100	23,500	11,900	10,600	7,850
22	53,800	34,800	34,800	37,500	66,100	266,000	41,600	32,100	21,200	13,800	10,200	7,850
23	45,700	38,900	33,400	34,800	62,700	257,000	47,000	30,800	19,600	15,300	9,350	8,960
24	43,000	40,200	30,800	32,100	60,600	216,000	59,300	30,200	17,900	19,600	8,960	9,750
25	43,000	38,900	29,600	34,800	58,600	152,000	57,900	28,300	17,900	19,000	8,580	9,750
26	45,700	35,500	30,800	37,500	56,600	105,000	67,400	27,100	16,900	16,900	8,580	9,350
27	40,900	32,100	34,100	33,400	83,800	86,500	64,000	25,900	17,900	16,900	8,580	8,960
28	36,200	29,600	32,800	33,400	119,000	89,200	56,600	24,700	20,100	20,100	8,580	8,580
29	32,100	27,100	29,600	32,100	.....	112,000	51,100	24,100	19,600	23,500	9,750	8,580
30	29,600	28,300	27,100	30,200	.....	138,000	47,000	23,500	18,500	23,500	11,000	8,960
31	27,100	.....	25,300	30,200	.....	149,000	.....	23,500	.....	29,600	11,000	.....
1900.												
1	8,580	8,210	10,600	16,900	17,900	48,400	47,000	36,200	15,800	53,800	36,200	12,400
2	8,210	8,210	10,600	16,000	16,900	53,200	43,000	32,100	15,800	49,800	30,800	11,900
3	7,850	7,850	10,600	15,100	14,800	68,100	40,200	30,800	16,900	41,600	26,500	13,300
4	7,850	8,210	10,600	14,200	14,300	79,000	43,000	29,600	17,900	36,800	23,500	14,300
5	7,500	9,750	11,000	13,300	16,300	81,000	48,400	28,300	17,900	33,400	20,100	13,300
6	7,160	9,750	10,600	12,400	19,600	66,100	52,500	27,100	19,600	30,800	17,900	11,900
7	7,160	9,750	10,200	12,800	22,400	62,000	47,000	25,900	32,100	28,300	16,300	10,600
8	7,850	9,350	9,750	13,300	21,800	72,900	41,600	24,700	38,900	25,300	14,800	10,200
9	8,580	9,350	9,350	13,800	30,800	93,300	38,200	24,700	36,200	23,500	13,800	9,350
10	10,200	8,580	9,350	13,800	51,100	106,000	35,500	24,700	30,200	23,500	13,300	8,960
11	11,000	8,580	10,200	19,000	57,900	104,000	38,200	24,100	28,300	24,100	12,400	8,580
12	11,000	8,210	29,600	34,800	55,200	90,600	45,000	24,100	27,700	21,200	11,900	8,210
13	10,600	7,850	37,500	49,800	88,500	72,900	44,300	23,500	25,300	19,000	11,400	7,850
14	10,200	7,850	44,300	53,200	141,000	60,600	41,600	22,400	29,600	18,500	11,400	8,210
15	9,350	7,850	43,000	51,100	157,000	52,500	38,200	21,200	30,200	18,500	12,400	11,000
16	8,580	7,850	36,200	47,000	140,000	48,400	36,800	21,200	29,600	18,500	12,800	17,400
17	8,580	7,850	29,600	37,500	110,000	47,000	53,800	20,100	30,800	17,900	13,300	22,400
18	8,580	7,850	23,500	31,500	75,600	45,700	66,100	19,600	36,200	17,400	13,300	22,900
19	8,210	7,850	21,200	33,400	56,600	45,700	60,600	19,000	53,800	16,900	13,300	25,900
20	8,210	7,850	23,500	51,800	46,400	52,500	57,900	19,000	56,600	16,300	12,800	26,500
21	8,210	7,160	24,700	57,900	42,300	72,900	73,600	17,900	54,500	15,300	11,400	21,800
22	8,210	7,160	24,700	53,800	46,400	96,000	75,600	17,900	45,700	14,300	11,000	16,900
23	7,850	7,850	23,500	48,400	51,800	112,000	71,500	16,900	37,500	14,300	10,600	14,800
24	7,850	8,580	32,100	43,000	52,500	106,000	66,800	16,900	36,200	15,800	11,000	13,800
25	7,850	8,960	36,200	36,200	52,500	79,700	60,600	17,900	43,000	16,900	11,400	15,300
26	7,160	10,600	36,800	31,500	58,600	70,200	51,800	17,900	45,700	17,400	14,300	15,300
27	7,160	11,000	33,400	28,300	57,200	68,100	47,000	19,000	48,400	18,500	17,400	14,800
28	7,160	11,000	32,100	25,900	51,100	66,800	44,300	20,100	49,800	25,900	15,300	13,800
29	7,500	11,000	28,900	23,500	.....	63,400	41,600	20,100	52,500	48,400	14,300	13,300
30	7,850	11,000	25,900	21,800	.....	57,900	38,900	19,000	53,200	49,800	13,300	12,800
31	7,850	.....	21,200	20,100	.....	51,800	.....	16,900	.....	43,600	12,800	.....

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Daily discharge, in second-feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1901.												
1	11,900	16,300	53,200	29,600	38,200	20,700	78,300	67,400	75,600	34,800	15,800	61,300
2	11,000	14,800	38,200	32,800	39,600	20,700	83,800	57,200	69,500	34,100	15,800	60,600
3	10,600	14,300	32,100	33,400	43,000	20,700	128,000	51,800	60,600	36,800	16,300	60,000
4	9,750	16,300	28,900	32,100	53,200	20,700	158,000	45,700	51,800	37,500	15,800	64,000
5	9,350	18,500	32,100	28,900	62,700	21,200	157,000	41,600	46,400	34,800	14,800	57,900
6	8,960	20,700	40,900	26,500	62,000	22,400	146,000	39,600	40,900	29,600	14,800	47,700
7	8,960	23,500	50,400	24,700	57,900	22,900	123,000	37,500	40,900	28,900	17,900	40,900
8	10,200	23,500	56,600	22,900	54,500	22,900	90,600	36,200	40,900	30,800	55,900	37,500
9	11,000	20,700	51,800	21,800	51,800	22,400	74,200	34,100	38,200	32,100	77,000	34,100
10	12,400	17,900	41,600	21,200	46,400	41,600	64,000	32,100	40,900	36,800	61,300	31,500
11	12,400	16,900	35,500	35,500	45,700	60,600	56,600	32,100	49,800	38,900	43,600	30,200
12	14,300	15,300	30,800	98,700	41,600	70,200	51,100	30,800	44,300	32,100	33,400	28,900
13	16,900	14,300	27,700	175,000	42,300	60,000	47,700	32,100	37,500	28,300	30,200	32,800
14	14,300	13,300	25,300	185,000	43,000	49,800	40,200	31,500	35,500	24,700	38,200	34,100
15	11,400	12,800	24,100	166,000	41,600	43,600	60,600	31,500	37,500	22,900	89,200	34,800
16	11,000	12,400	23,500	127,000	37,500	37,500	64,000	30,800	45,000	20,100	180,000	35,500
17	10,200	11,900	22,400	80,400	33,400	33,400	63,400	29,600	54,500	20,700	217,000	36,800
18	9,750	11,900	20,100	60,000	30,200	30,800	59,300	27,700	60,600	21,800	216,000	53,800
19	9,350	11,400	19,000	49,100	28,900	28,300	67,400	30,200	57,200	20,700	188,000	61,300
20	8,960	11,400	18,500	43,000	28,300	26,500	137,000	48,400	54,500	20,700	153,000	57,200
21	8,580	12,400	18,500	37,500	27,700	26,500	174,000	63,400	51,100	23,500	120,000	50,400
22	8,580	12,800	22,400	34,100	26,500	27,100	162,000	131,000	46,400	21,800	110,000	44,300
23	9,350	13,300	23,500	30,800	25,300	29,600	150,000	174,000	62,700	20,700	106,000	37,500
24	12,800	15,800	26,500	32,100	24,700	28,300	145,000	196,000	58,600	19,600	120,000	32,100
25	22,900	17,900	29,600	33,400	23,500	28,300	123,000	214,000	45,700	17,400	106,000	29,600
26	41,600	47,000	30,800	33,400	22,900	46,400	110,000	215,000	59,300	16,900	83,100	27,700
27	45,000	88,500	29,600	30,800	21,200	102,000	95,300	154,000	60,600	16,300	68,800	25,900
28	34,800	100,000	25,900	29,600	20,700	146,000	95,300	85,800	51,100	16,300	64,000	24,700
29	27,700	100,000	24,100	29,600	.....	142,000	92,600	76,300	43,000	15,800	66,800	24,700
30	20,700	83,800	23,500	29,600	.....	119,000	87,800	74,900	37,500	15,800	62,000	24,100
31	19,000	.....	25,300	31,500	.....	94,000	.....	77,600	.....	15,800	60,600	.....
1902.												
1	23,500	14,800	13,300	267,000	131,000	157,000	204,000	32,100	22,400	60,600	12,800	9,350
2	25,300	14,800	12,800	271,000	142,000	211,000	178,000	51,800	21,200	63,400	11,900	8,580
3	25,900	14,300	13,300	250,000	152,000	237,000	116,000	57,200	20,100	53,800	12,400	8,580
4	25,300	14,300	14,300	176,000	141,000	252,100	77,600	48,400	19,600	45,000	13,800	9,750
5	24,700	14,300	14,300	96,000	116,000	238,000	66,800	40,200	19,000	38,200	13,800	8,960
6	27,100	14,300	14,300	68,100	92,600	200,000	62,000	34,800	19,000	31,500	15,800	9,350
7	25,300	13,800	16,900	60,000	73,600	167,000	58,600	32,100	17,900	25,300	14,300	9,750
8	22,900	13,800	17,900	54,500	62,000	135,000	60,600	32,100	17,900	22,400	12,400	9,750
9	21,800	13,800	17,900	48,400	53,800	116,000	61,300	31,500	18,500	20,700	11,400	9,750
10	20,700	13,800	19,600	46,400	49,100	110,000	58,600	29,600	19,000	19,600	12,800	9,750
11	19,000	13,800	19,600	43,600	45,000	90,600	54,500	28,300	17,900	19,000	15,800	9,350
12	19,000	13,800	22,400	40,900	40,900	81,700	51,100	27,100	19,000	19,000	15,300	9,750
13	19,600	14,300	22,900	38,200	37,500	76,300	48,400	25,900	19,600	20,100	13,800	11,400
14	22,400	14,300	26,500	36,200	34,800	70,200	45,000	25,300	18,500	27,100	11,900	12,400
15	24,100	14,300	116,000	33,400	34,800	65,400	43,600	25,300	17,400	28,300	10,600	11,900
16	22,900	14,300	176,000	31,500	35,500	62,000	42,300	25,900	16,900	23,500	10,200	11,400
17	22,900	13,800	190,000	30,200	34,800	77,000	40,900	26,500	16,900	21,200	9,750	11,000
18	22,400	13,800	176,000	28,900	33,400	92,600	40,200	25,300	16,900	18,500	9,750	9,750
19	20,700	13,300	129,000	28,900	32,100	95,300	39,600	25,300	22,400	17,400	9,750	9,350
20	18,500	13,300	71,500	29,600	31,500	89,900	38,900	24,700	25,300	16,300	9,350	9,350
21	17,400	12,800	50,400	30,800	29,600	77,600	38,200	24,700	25,900	14,800	9,750	9,350
22	17,400	12,400	38,900	36,200	32,800	66,100	36,800	25,300	24,700	15,300	10,200	11,900
23	17,400	12,800	32,800	38,200	40,200	58,600	35,500	27,100	22,400	16,300	10,200	14,800
24	16,900	14,300	33,400	39,600	47,700	54,500	34,800	25,900	21,800	14,800	9,750	14,800
25	16,900	14,300	40,900	38,900	49,100	50,400	34,100	25,900	20,700	13,300	9,350	15,800
26	16,300	14,300	47,700	35,500	51,800	47,000	32,800	25,300	19,600	11,900	9,350	18,500
27	15,800	14,800	63,400	36,800	52,500	45,000	31,500	23,500	22,400	11,900	9,750	20,100
28	15,300	14,300	103,000	51,800	84,400	43,000	30,800	22,400	21,800	11,400	9,750	20,100
29	14,800	14,300	157,000	79,700	.....	81,700	29,600	24,700	22,400	11,400	10,200	20,100
30	14,300	13,800	212,000	101,000	.....	174,000	29,600	25,300	28,300	11,900	11,400	19,600
31	14,300	.....	248,000	123,000	.....	205,000	.....	24,100	.....	13,300	10,600	.....

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Daily discharge, in second-feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1903.												
1	21,800	8,960	29,600	26,500	27,100	174,000	112,000	55,200	38,200	22,900	15,800	10,600
2	20,700	8,960	28,900	25,300	27,700	205,000	107,000	50,400	49,800	21,200	14,800	10,200
3	21,800	9,350	39,600	30,200	28,900	193,000	94,600	47,000	72,900	20,700	16,300	9,350
4	18,500	9,750	44,300	35,500	45,700	154,000	82,400	43,600	72,200	20,100	21,200	9,350
5	16,900	9,750	47,000	40,900	96,700	106,000	77,600	41,600	62,700	20,100	21,200	8,960
6	15,800	9,750	45,000	40,200	127,000	83,100	78,300	39,600	57,200	21,200	23,500	8,960
7	13,800	9,350	45,000	49,800	113,000	77,600	74,900	38,900	60,600	21,800	27,700	8,960
8	12,400	11,000	38,900	45,700	116,000	93,300	99,400	36,800	70,200	21,200	23,500	8,960
9	11,900	12,800	34,800	39,600	111,000	135,000	161,000	34,800	65,400	22,400	20,100	8,960
10	11,400	12,400	30,200	34,800	96,000	159,000	200,000	33,400	55,200	22,400	16,900	8,580
11	12,800	11,400	26,500	31,500	91,900	157,000	210,000	32,100	53,200	21,800	14,800	8,580
12	16,300	11,000	23,500	36,200	103,000	137,000	184,000	30,800	47,000	21,200	15,300	8,210
13	15,300	11,000	21,800	42,300	105,000	118,000	128,000	29,600	48,400	22,900	18,500	8,210
14	15,300	10,200	20,100	43,000	94,600	104,000	113,000	28,300	42,300	32,800	16,300	8,210
15	18,500	9,750	19,000	38,200	86,500	95,300	133,000	27,700	36,800	31,500	17,900	8,580
16	19,000	9,350	19,600	34,800	77,600	86,500	143,000	27,100	32,100	30,800	21,200	8,210
17	19,600	9,350	27,100	33,400	119,000	74,900	138,000	26,500	28,900	32,100	22,900	7,850
18	16,900	9,350	44,300	30,800	170,000	66,800	122,000	25,900	26,500	28,900	21,200	8,580
19	15,800	10,600	47,000	28,900	193,000	60,600	103,000	25,300	24,700	26,500	19,000	8,960
20	14,800	11,400	43,000	27,100	191,000	55,200	90,600	24,100	24,100	22,900	21,200	8,960
21	12,800	12,400	41,600	25,300	160,000	55,200	83,800	23,500	24,100	21,200	18,500	8,210
22	11,900	11,400	53,200	24,700	98,700	55,200	82,400	22,900	24,100	22,400	16,900	8,580
23	11,000	11,400	59,300	23,500	70,800	62,000	82,400	22,400	24,100	20,100	16,300	8,580
24	11,000	11,900	53,200	22,400	61,300	108,000	74,200	22,400	24,100	17,900	14,300	8,210
25	10,200	12,400	43,000	22,400	53,800	169,000	67,400	21,200	23,500	16,300	12,800	7,850
26	9,750	19,600	38,200	23,500	48,400	190,000	62,700	21,200	22,900	15,300	11,900	7,850
27	9,350	35,500	32,800	24,100	45,000	180,000	59,300	20,100	22,900	14,800	11,000	7,160
28	9,350	36,800	28,900	24,700	80,400	131,000	56,600	19,600	25,300	13,800	10,600	6,830
29	8,960	33,400	25,300	25,300	.....	87,800	56,600	19,600	26,500	13,300	10,200	6,830
30	8,580	30,800	24,100	26,500	.....	83,100	59,300	21,200	25,300	13,300	10,200	6,510
31	8,580	.....	25,900	27,100	.....	103,000	.....	26,500	.....	12,800	11,000	.....
1904.												
1	6,510	7,160	8,210	17,400	19,000	49,100	55,200	34,800	24,100	20,100	12,800	12,800
2	6,510	7,500	8,210	14,800	17,400	44,300	49,100	45,700	22,900	20,700	12,800	11,900
3	6,510	8,210	8,210	13,300	15,800	41,600	43,000	39,600	24,100	24,100	14,800	11,000
4	6,510	8,580	7,850	12,800	15,300	38,900	38,900	33,400	24,700	22,400	13,800	11,000
5	6,510	11,000	7,850	11,900	14,300	35,500	34,800	30,800	27,700	21,800	14,800	10,600
6	6,510	11,000	7,500	11,900	13,800	36,200	32,100	29,600	27,700	19,000	16,300	10,600
7	6,510	9,750	7,850	10,600	13,300	35,500	30,800	27,700	25,300	17,400	20,700	12,800
8	7,160	9,350	7,500	10,200	20,100	48,400	30,800	30,800	21,200	16,300	20,700	13,800
9	7,850	8,960	7,850	9,750	27,100	68,800	33,400	32,100	20,700	15,300	18,500	12,800
10	9,750	8,960	7,500	10,200	34,100	70,800	34,100	37,500	20,700	16,300	18,500	11,900
11	9,350	8,960	7,500	10,600	30,800	69,500	34,800	41,600	19,000	16,300	18,500	11,000
12	8,960	8,960	7,500	10,600	31,500	62,700	32,100	43,000	17,900	17,400	18,500	10,200
13	8,580	8,960	7,850	11,400	27,700	55,200	30,200	38,900	15,800	17,400	22,900	9,350
14	8,580	8,960	7,500	12,400	24,700	51,800	27,700	32,800	14,800	20,100	20,700	8,960
15	7,850	8,580	7,500	13,300	21,800	55,900	26,500	30,800	14,300	19,000	18,500	8,580
16	7,500	8,580	7,850	14,300	20,100	54,500	24,700	29,600	14,300	16,900	18,500	8,210
17	7,850	9,750	8,580	14,800	19,600	49,100	24,100	27,700	13,800	14,800	22,900	7,850
18	7,850	20,100	8,210	16,300	18,500	42,300	24,100	25,300	12,800	13,800	21,800	7,850
19	7,850	32,100	7,850	21,800	17,400	38,900	24,100	24,100	12,400	12,800	17,400	7,500
20	7,500	33,400	9,350	21,200	17,900	35,500	23,500	22,900	11,900	12,400	15,300	7,500
21	7,500	25,900	16,900	20,100	20,700	33,400	22,900	21,200	11,900	11,000	13,800	7,500
22	7,500	21,200	26,500	20,100	29,600	44,300	22,400	20,100	12,400	10,600	13,800	7,160
23	7,500	17,400	24,700	24,800	36,800	81,700	22,400	19,600	14,800	11,400	12,800	7,160
24	7,160	14,300	20,700	66,100	47,700	118,000	22,400	19,000	15,300	12,800	12,800	7,160
25	7,160	12,400	20,700	56,600	49,100	142,000	22,400	17,400	13,300	12,400	16,300	7,160
26	6,830	11,000	19,000	45,000	47,700	136,000	21,200	16,300	13,300	11,900	16,900	6,830
27	6,830	10,200	17,400	42,300	42,300	124,000	20,700	15,800	12,800	12,800	15,800	6,510
28	6,510	9,750	20,700	33,400	43,600	109,000	22,900	15,300	12,800	13,800	14,800	6,510
29	6,510	8,960	21,200	27,100	55,200	89,200	25,900	15,300	15,300	12,400	14,800	6,510
30	6,510	8,580	21,200	23,500	.....	74,200	26,500	14,800	19,000	14,800	14,300	6,510
31	6,830	.....	20,700	21,200	.....	64,000	.....	16,900	.....	16,300	13,300	.....

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Daily discharge, in second-feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1905.												
1	6,830	5,060	8,210	39,600	15,800	52,500	27,100	52,500	34,100	52,500	21,200	19,000
2	6,830	5,060	9,350	30,800	17,900	47,700	27,100	48,400	30,800	36,800	21,200	18,500
3	6,510	5,330	10,600	30,800	17,900	43,600	25,300	40,900	27,100	29,600	24,100	19,600
4	6,200	5,900	12,800	22,400	17,400	40,200	24,700	36,200	24,100	24,700	21,800	18,500
5	5,900	6,200	12,400	23,500	16,900	37,500	24,100	32,800	22,900	23,500	18,500	19,600
6	6,200	6,200	19,600	25,300	21,200	35,500	24,700	30,200	21,200	22,900	16,900	19,600
7	5,900	6,510	24,700	24,100	28,900	34,100	25,300	28,900	20,700	21,800	16,900	18,500
8	5,610	6,510	33,400	25,900	37,500	32,100	28,300	31,500	19,600	22,400	15,800	18,500
9	5,330	6,510	32,800	27,100	76,300	34,100	27,700	38,200	19,000	25,300	17,900	17,900
10	5,610	7,500	30,800	29,600	133,000	66,100	36,200	47,700	19,000	25,900	19,600	16,900
11	5,610	7,500	23,500	28,300	146,000	104,000	36,800	48,400	17,400	25,300	28,900	15,300
12	5,610	7,500	19,600	28,900	131,000	112,000	39,600	43,000	16,900	29,600	38,200	14,300
13	5,610	7,160	16,900	59,300	103,000	98,700	41,600	36,800	16,300	38,900	43,000	15,800
14	5,330	6,510	15,300	111,000	86,500	85,100	43,600	33,400	16,900	65,400	51,100	15,300
15	5,330	6,510	14,300	106,000	84,400	66,100	47,000	33,400	17,400	80,400	54,500	14,300
16	5,330	6,830	13,800	96,700	77,000	53,800	44,300	43,000	17,900	70,800	53,800	13,800
17	5,330	7,160	13,300	70,800	70,200	46,400	39,600	68,100	18,500	56,600	45,700	13,800
18	5,330	7,500	12,400	49,100	57,900	40,900	34,800	87,200	18,500	43,600	41,600	13,300
19	5,330	7,850	11,900	38,900	50,400	37,500	31,500	85,800	17,400	36,200	37,500	12,800
20	5,330	8,210	11,000	33,400	47,700	34,800	28,900	74,200	24,100	31,500	35,500	11,900
21	5,060	7,850	10,600	30,200	95,300	38,200	26,500	59,300	27,700	28,900	33,400	11,900
22	5,060	7,850	10,200	28,300	140,000	41,600	26,500	47,000	28,300	30,800	28,900	11,400
23	5,060	7,500	9,750	26,500	137,000	45,000	26,500	44,300	34,800	28,900	25,900	11,000
24	5,060	7,850	9,350	24,700	126,000	41,600	26,500	58,600	34,100	26,500	23,500	10,600
25	5,060	7,850	9,350	22,400	100,000	37,500	25,300	63,400	32,800	27,100	33,400	10,600
26	5,060	7,850	11,900	20,700	83,100	35,500	24,700	53,800	28,900	28,300	41,600	10,200
27	5,060	8,210	16,900	19,000	70,200	32,800	30,200	45,700	25,300	30,800	34,800	10,200
28	5,060	7,850	43,600	16,300	60,000	30,800	36,200	40,200	24,700	27,100	30,800	9,750
29	5,060	7,850	63,400	13,800	.....	29,600	37,500	35,500	34,800	23,500	28,300	9,350
30	5,060	7,850	59,300	13,800	.....	28,900	45,700	33,400	32,100	21,200	25,300	9,350
31	5,060	.....	45,700	15,300	.....	27,700	.....	34,100	.....	21,200	22,400	.....
1906.												
1	8,960	14,800	9,750	31,500	59,300	30,200	94,600	27,700	22,900	25,900	46,400	82,400
2	8,960	13,800	10,200	28,900	55,900	29,600	78,300	27,100	21,200	23,500	55,200	73,600
3	9,350	12,800	13,800	28,300	53,800	31,500	66,100	27,100	22,900	21,800	58,600	64,000
4	9,350	11,900	38,900	50,400	50,400	49,800	56,600	27,700	24,100	20,700	49,800	54,500
5	10,200	11,400	65,400	75,600	46,400	57,900	50,400	28,900	24,100	19,600	45,700	46,400
6	10,600	11,000	60,000	81,700	41,600	52,500	45,000	31,500	24,100	19,600	47,700	47,700
7	10,600	10,600	53,800	76,300	38,200	46,400	42,300	34,800	22,900	20,700	43,600	55,900
8	10,200	10,200	42,300	68,100	35,500	43,000	40,900	43,000	21,800	20,700	40,900	64,700
9	9,750	10,200	38,900	55,900	33,400	39,600	40,900	49,800	21,800	24,700	36,200	64,700
10	9,750	10,200	58,600	49,100	32,100	36,800	44,300	54,500	21,200	30,800	33,400	57,200
11	10,200	10,200	60,000	45,700	30,200	34,100	52,500	50,400	20,100	31,500	31,500	56,600
12	14,800	9,750	57,900	41,600	28,300	32,800	57,200	41,600	17,900	29,600	29,600	53,800
13	17,900	9,750	49,100	39,600	27,100	30,800	53,200	35,500	17,900	25,300	27,700	48,400
14	20,700	9,350	40,200	40,900	26,500	28,900	49,100	31,500	24,700	26,500	26,500	41,600
15	16,900	9,350	35,500	40,900	26,500	32,800	51,100	28,900	30,800	39,600	28,900	36,200
16	16,900	8,960	39,600	44,300	25,900	43,600	53,200	27,100	47,000	53,200	36,800	32,800
17	14,800	8,960	38,900	48,400	25,900	61,300	57,900	25,300	56,600	47,700	43,600	29,600
18	13,300	8,960	34,800	54,500	25,300	66,100	62,700	23,500	52,500	57,200	43,000	27,700
19	12,400	8,580	32,800	53,200	25,300	64,700	63,400	22,400	46,400	90,600	45,700	27,100
20	11,400	8,960	30,800	48,400	24,700	66,800	54,500	21,200	40,200	96,000	46,400	35,500
21	11,000	8,960	36,800	45,000	24,700	66,100	46,400	20,700	34,800	67,400	46,400	49,100
22	11,000	9,350	45,000	43,600	27,700	60,000	41,600	20,100	31,500	64,000	43,600	69,500
23	11,400	10,200	49,100	53,200	31,500	54,500	38,200	19,600	28,900	75,600	40,900	64,000
24	11,900	10,200	57,900	78,300	34,800	49,100	34,800	19,600	27,700	87,200	38,200	56,600
25	11,400	9,750	68,800	112,000	33,400	44,300	32,800	19,000	34,800	77,600	38,200	51,800
26	12,400	9,750	64,700	140,000	31,500	40,900	30,800	18,500	38,900	60,000	42,300	46,400
27	16,300	9,750	55,200	123,000	30,200	39,600	29,600	18,500	39,600	49,100	43,600	41,600
28	18,500	9,750	47,000	85,100	29,600	40,900	30,200	20,700	36,200	45,000	39,600	38,900
29	18,500	9,750	41,600	69,500	.....	45,700	32,100	21,800	31,500	43,000	38,200	34,100
30	16,900	9,750	37,500	63,400	.....	59,300	30,200	22,900	28,300	38,900	46,400	35,500
31	16,300	.....	34,800	62,700	.....	87,200	.....	25,900	.....	41,600	60,000	.....

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Daily discharge, in second-feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1915—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1907.												
1	88,500	25,300	36,800	133,000	28,300	64,700	32,100	41,600	25,300	36,800	33,400	16,900
2	125,000	24,700	36,200	127,000	57,200	77,600	36,800	38,900	30,800	33,400	33,400	15,800
3	125,000	24,100	32,800	98,700	70,200	111,000	41,600	36,200	34,100	32,100	25,300	14,800
4	116,000	23,500	32,100	79,000	62,700	119,000	37,500	34,800	35,500	28,300	22,900	14,800
5	87,800	21,800	31,500	66,800	55,900	109,000	35,500	34,100	47,700	25,900	20,100	13,300
6	86,500	21,800	30,200	59,300	58,600	92,600	34,100	39,600	53,200	25,300	19,600	13,300
7	98,000	21,800	30,200	53,200	61,300	70,200	52,500	47,700	51,100	24,100	19,600	13,800
8	98,700	21,200	30,800	47,700	59,300	59,300	70,200	59,300	46,400	21,800	16,900	13,800
9	85,100	20,700	31,500	44,300	53,200	58,600	60,600	74,200	49,100	21,200	16,900	13,800
10	71,500	20,100	30,200	40,900	47,000	58,600	61,300	77,600	60,600	20,700	16,300	14,300
11	61,300	19,600	29,600	38,900	42,300	62,000	62,000	79,000	82,400	20,100	16,900	16,300
12	52,500	19,600	32,100	37,500	38,900	75,600	57,900	77,000	85,800	19,600	19,600	22,900
13	45,700	19,600	32,100	36,800	36,200	77,600	55,200	62,000	71,500	23,500	22,900	25,900
14	41,600	20,700	31,500	34,800	34,100	74,900	49,100	54,500	61,300	32,100	21,200	25,900
15	37,600	22,400	30,800	33,400	32,100	76,300	42,300	49,800	70,200	44,300	19,600	24,100
16	34,800	22,900	30,200	32,100	30,800	79,700	39,600	49,100	64,000	43,600	18,500	20,100
17	32,800	24,700	28,900	30,800	30,200	77,000	38,200	45,000	98,000	36,800	19,600	17,400
18	32,100	24,700	33,400	30,200	28,300	72,200	38,200	40,900	96,000	36,200	20,100	15,300
19	41,600	49,800	51,800	28,900	27,700	66,100	38,200	37,500	64,700	36,200	20,100	14,800
20	42,300	144,000	56,600	28,900	27,100	57,200	40,900	32,800	50,400	27,700	19,600	12,400
21	40,900	202,000	54,500	32,100	26,500	51,100	47,700	31,500	45,000	25,900	19,000	12,400
22	41,600	220,000	57,200	38,900	25,900	46,400	45,700	28,300	42,300	25,300	22,400	12,400
23	54,500	205,000	51,100	48,400	25,300	45,700	44,300	26,500	39,600	23,500	23,500	20,700
24	51,100	144,000	46,400	43,600	24,700	38,900	49,100	25,900	35,500	21,200	22,900	51,100
25	44,300	82,400	43,600	38,900	27,100	35,500	51,800	25,300	35,500	21,200	22,900	63,400
26	38,900	60,000	38,900	35,500	40,200	34,100	51,800	24,700	40,900	20,700	21,200	66,100
27	34,800	52,500	35,500	33,400	56,600	32,800	51,800	24,700	41,600	20,100	21,800	57,200
28	32,100	46,400	33,400	31,500	62,700	31,500	52,500	25,300	41,600	20,100	21,800	40,200
29	29,600	43,000	34,100	30,200	.....	30,800	53,200	25,300	40,200	18,500	20,100	33,400
30	27,700	40,200	62,700	29,600	.....	29,600	45,700	24,700	42,300	19,000	17,900	33,400
31	26,500	.....	105,000	28,900	.....	28,300	.....	24,700	.....	24,100	16,900	.....
1908.												
1	32,100	12,400	41,600	120,000	40,200	44,300	47,000	64,000	30,800	17,400	18,500	21,200
2	27,100	11,900	32,800	116,000	50,400	43,600	43,600	60,600	31,500	16,300	19,000	18,500
3	25,900	12,800	30,200	100,000	63,400	45,000	43,600	59,300	31,500	15,800	19,000	17,900
4	21,200	14,300	27,100	75,600	57,200	51,100	45,700	56,600	30,200	16,900	17,400	16,900
5	19,600	20,100	25,300	66,800	52,500	60,600	85,100	58,600	32,800	25,300	15,800	14,800
6	19,000	20,700	23,500	85,800	50,400	64,000	91,200	59,300	35,500	32,100	17,900	16,900
7	20,100	20,700	22,400	99,400	61,300	58,600	68,800	62,000	35,500	38,900	22,900	20,700
8	21,800	20,700	21,200	87,200	48,400	51,100	55,200	64,700	36,200	40,900	23,500	23,500
9	21,200	17,900	19,600	77,000	45,000	59,300	48,400	70,200	36,200	37,500	26,500	25,300
10	20,100	16,300	19,600	65,400	49,100	60,600	44,300	72,900	34,800	43,600	29,600	27,700
11	18,500	25,900	20,700	58,600	57,900	51,100	40,900	77,000	33,400	43,600	31,500	23,500
12	17,400	36,800	24,100	60,600	57,900	46,400	38,200	75,600	32,800	40,200	28,300	21,200
13	16,300	51,100	28,300	76,300	55,200	51,100	35,500	41,600	32,100	32,100	25,300	18,500
14	16,300	65,400	32,100	115,000	69,500	66,800	33,400	36,800	31,500	25,900	22,400	15,800
15	15,300	49,100	36,200	132,000	101,000	77,000	33,400	34,100	30,200	23,500	20,100	14,300
16	14,300	34,800	38,900	118,000	142,000	81,000	34,800	32,100	30,200	24,100	18,500	13,300
17	12,800	28,900	38,900	90,600	162,000	57,900	36,800	29,600	31,500	25,300	16,900	11,900
18	12,800	25,300	39,600	77,600	155,000	51,800	39,600	27,700	33,400	24,100	16,300	11,900
19	12,400	25,900	37,500	71,500	130,000	47,700	47,000	27,100	35,500	22,400	16,300	11,900
20	12,400	27,100	34,100	63,400	98,000	45,700	49,800	29,600	35,500	20,700	16,300	11,400
21	11,900	30,200	32,100	56,600	75,600	49,100	46,400	32,100	34,100	20,700	19,000	11,900
22	11,900	34,800	29,600	51,800	63,400	60,600	43,600	35,500	32,800	21,200	22,900	11,900
23	11,900	39,600	28,900	46,400	56,600	72,200	41,600	35,500	32,100	19,600	24,700	11,900
24	11,900	57,900	33,400	44,300	51,100	84,400	40,900	34,800	19,000	17,400	43,600	11,400
25	11,900	77,600	38,200	39,600	47,000	102,000	48,400	33,400	19,000	16,900	46,400	11,000
26	11,900	86,500	42,300	35,500	44,300	108,000	60,600	32,800	18,500	16,900	32,100	10,600
27	11,900	84,400	47,000	33,400	45,000	97,400	74,900	31,500	24,700	16,300	32,100	10,200
28	11,900	76,300	46,400	32,100	46,400	81,700	88,500	31,500	24,700	16,300	32,800	10,200
29	11,900	57,200	41,600	32,100	45,700	67,400	87,800	30,200	22,400	15,800	42,300	10,200
30	12,400	46,400	43,600	36,200	.....	57,200	73,600	30,200	20,700	16,300	40,200	9,750
31	12,800	.....	93,300	35,500	.....	51,100	.....	29,600	.....	17,400	27,700	.....

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Daily discharge, in second-feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1915—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1909.												
1	9,750	36,800	13,300	43,000	35,500	84,400	104,000	88,000	39,000	45,600	33,900	16,500
2	9,350	35,500	13,800	47,700	34,100	69,500	81,200	137,000	38,400	47,600	43,700	16,500
3	9,350	28,300	17,900	45,700	32,800	60,000	66,300	160,000	40,400	49,600	48,900	16,500
4	9,350	25,300	27,100	43,000	32,100	53,800	56,200	155,000	102,000	47,600	52,200	16,500
5	9,350	23,500	28,900	43,000	30,800	49,100	50,300	127,000	149,000	43,700	53,600	14,500
6	9,350	19,000	27,700	51,800	32,100	46,400	47,000	90,000	163,000	39,000	51,600	14,500
7	8,960	16,900	35,500	61,300	39,600	50,400	45,000	71,700	151,000	35,200	43,700	14,000
8	8,960	15,800	64,000	61,300	49,100	66,100	45,600	64,300	108,000	38,400	38,400	14,000
9	9,350	15,300	89,200	59,300	48,400	72,200	51,600	50,900	80,500	71,000	34,600	14,000
10	9,750	14,800	83,100	51,800	59,300	103,000	53,600	47,000	90,700	117,000	30,200	15,500
11	10,600	14,300	70,800	47,000	85,800	132,000	48,900	47,600	80,500	109,000	28,400	17,600
12	12,400	13,800	55,200	42,300	116,000	149,000	44,300	52,200	75,700	76,400	27,200	17,000
13	13,800	14,800	45,000	40,200	110,000	140,000	43,700	63,600	70,300	57,600	26,000	17,600
14	13,800	19,000	45,700	38,900	105,000	152,000	47,000	58,300	63,000	55,600	23,700	17,000
15	14,800	19,600	47,700	40,200	85,800	161,000	48,300	48,900	67,000	75,000	26,000	16,500
16	13,800	19,000	45,700	58,600	92,600	139,000	48,300	43,000	71,000	81,200	26,600	15,500
17	12,800	17,900	40,200	78,300	127,000	108,000	47,000	39,700	71,000	72,300	26,000	15,000
18	11,900	16,900	34,800	90,600	129,000	91,400	44,300	37,100	65,000	61,600	63,000	14,500
19	11,400	16,300	30,800	103,000	107,000	77,100	39,700	35,200	58,300	48,300	81,200	15,500
20	11,400	16,300	28,300	106,000	92,600	69,600	34,600	33,900	57,600	40,400	52,900	16,000
21	11,000	15,800	26,500	81,700	79,700	69,000	33,300	41,000	52,900	37,800	39,700	16,500
22	10,600	15,800	25,900	62,000	75,600	74,400	34,600	63,600	54,200	35,800	32,100	16,000
23	9,750	15,300	44,300	50,400	111,000	73,000	38,400	127,000	50,300	33,900	27,200	20,300
24	9,350	15,300	66,800	45,000	131,000	67,000	47,600	137,000	46,300	32,100	26,000	21,400
25	9,350	14,800	76,300	40,900	141,000	62,300	54,900	98,800	49,600	37,800	22,500	26,000
26	12,800	14,300	74,200	37,500	139,000	71,700	50,900	67,600	54,900	33,900	20,300	30,200
27	20,700	14,300	62,000	34,800	123,000	88,600	47,000	54,900	51,600	31,400	19,200	27,200
28	28,300	13,800	47,700	32,800	105,000	91,400	45,600	47,600	56,200	29,600	18,600	21,400
29	21,200	13,800	42,300	32,100	.....	96,800	46,300	43,700	52,900	29,000	17,600	20,300
30	17,900	13,300	43,000	32,800	.....	111,000	47,000	42,300	48,300	25,400	17,000	18,600
31	19,600	.....	45,700	33,400	.....	115,000	.....	40,400	.....	26,000	17,000	.....
1910.												
1	16,000	11,700	10,300	13,100	27,200	45,000	18,600	34,600	43,000	33,300	41,700	15,500
2	15,000	11,700	10,300	12,600	26,600	65,000	18,100	30,800	38,400	35,200	47,000	19,700
3	14,000	11,700	9,900	12,100	25,400	83,900	17,600	28,400	35,200	35,800	38,400	53,600
4	13,100	11,200	9,900	15,500	24,300	81,200	17,000	26,600	34,600	39,700	32,700	50,900
5	12,100	11,200	9,900	16,000	24,800	71,000	17,000	24,800	32,700	39,700	30,800	41,700
6	12,100	11,200	9,900	19,200	26,000	58,900	16,500	23,700	32,700	38,400	34,600	38,400
7	11,700	11,200	10,800	33,300	27,800	50,300	16,500	22,500	49,600	43,700	35,800	34,600
8	11,200	11,200	18,600	70,300	27,800	43,700	15,500	22,500	54,900	54,900	34,600	34,600
9	11,200	10,800	24,300	70,300	27,200	39,000	15,500	39,000	46,300	70,300	36,500	32,100
10	11,200	10,800	24,800	58,300	25,400	36,500	15,000	48,900	42,300	67,000	30,800	29,000
11	11,700	10,300	22,500	52,900	24,800	33,900	15,000	50,900	41,700	63,600	31,400	28,400
12	12,600	10,300	21,400	41,700	24,300	33,900	15,000	50,900	40,400	62,300	29,600	26,600
13	14,000	10,300	19,700	33,300	23,700	33,900	14,500	49,600	39,000	52,200	25,400	26,600
14	16,000	10,300	23,100	29,000	23,700	32,700	14,500	42,300	41,000	47,000	23,100	25,400
15	21,400	10,300	26,600	26,000	23,700	32,100	14,500	37,800	43,000	47,600	20,800	22,500
16	33,900	9,900	29,600	24,300	23,100	31,400	16,000	33,900	42,300	49,600	20,300	20,300
17	30,800	9,900	32,700	23,700	23,100	29,600	20,300	33,900	45,600	52,200	19,200	18,600
18	25,400	9,900	30,200	23,100	41,700	27,800	34,600	34,600	45,600	50,300	18,600	17,600
19	23,100	9,900	27,200	22,500	77,100	26,600	46,300	39,700	45,000	48,300	17,600	16,000
20	19,700	9,900	22,500	27,800	85,900	25,400	43,000	43,700	41,000	43,000	17,600	15,500
21	17,000	9,900	20,300	38,400	79,100	24,300	38,400	48,300	39,700	39,000	17,000	14,500
22	16,500	9,900	19,200	47,000	71,000	23,700	34,600	54,200	37,800	36,500	19,700	14,000
23	15,000	9,900	18,100	56,900	62,300	23,700	31,400	55,600	36,500	33,900	19,700	14,000
24	14,500	9,900	16,500	55,600	58,900	22,000	28,400	53,600	33,300	31,400	18,100	13,600
25	13,600	10,800	15,000	54,900	54,200	22,000	26,600	67,000	32,700	29,000	17,600	13,100
26	13,100	11,200	16,000	47,600	47,600	22,000	26,600	82,500	32,700	28,400	17,000	12,600
27	13,100	11,700	18,100	39,700	41,000	21,400	26,600	77,800	32,100	27,200	16,500	12,600
28	13,100	11,200	18,100	35,200	38,400	20,300	27,800	71,700	30,800	26,000	16,000	13,100
29	12,600	10,800	17,600	32,100	.....	20,300	33,300	64,300	32,100	26,000	15,500	13,100
30	12,600	10,300	16,500	29,600	.....	19,700	36,500	54,200	32,700	28,400	16,500	13,600
31	12,100	.....	15,000	29,000	.....	19,200	.....	45,000	.....	31,400	16,500	.....

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Daily discharge, in second-feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1911.												
1	13,600	8,730	9,900	25,400	36,500	29,600	39,700	38,400	18,100	19,700	14,000	9,490
2	14,000	8,730	10,300	64,300	42,300	28,400	35,200	58,900	17,600	16,500	13,600	9,490
3	15,000	8,730	10,300	131,000	57,600	28,400	32,700	71,000	17,000	14,500	13,600	11,200
4	15,000	8,730	10,300	156,000	49,600	28,400	30,800	70,300	17,000	14,000	13,600	16,500
5	14,000	8,730	11,700	161,000	45,000	27,200	90,700	58,900	16,500	14,000	16,500	15,000
6	13,100	8,730	26,000	147,000	50,900	26,000	163,000	48,900	16,500	12,600	18,600	14,000
7	12,600	8,730	48,900	118,000	54,900	25,400	187,000	42,300	16,500	12,600	18,100	15,500
8	12,600	8,730	63,600	79,100	56,200	25,400	194,000	39,000	16,000	12,600	17,600	15,500
9	12,600	8,730	50,900	56,200	98,100	60,000	195,000	36,500	16,000	12,600	17,000	16,000
10	13,100	8,730	46,300	47,000	139,000	115,000	177,000	33,300	16,000	12,600	17,000	15,000
11	15,500	8,730	35,200	41,000	153,000	127,000	135,000	32,100	17,000	12,600	16,000	14,000
12	16,500	8,380	27,200	36,500	154,000	103,000	107,000	30,800	17,000	15,500	16,000	13,600
13	16,500	8,380	22,500	33,300	131,000	68,300	98,800	29,600	15,500	17,000	14,000	13,600
14	15,500	8,380	19,700	30,800	93,400	53,600	85,200	27,800	13,600	17,000	14,000	12,600
15	13,600	8,380	17,600	28,400	69,000	45,600	77,100	26,000	13,100	17,000	13,100	12,600
16	12,600	8,050	16,000	27,200	57,600	41,000	85,900	24,800	12,600	18,600	13,100	12,100
17	11,700	8,050	15,000	25,400	50,300	35,200	91,400	23,700	12,100	18,100	13,100	11,700
18	11,200	8,050	14,000	24,800	44,300	30,800	92,000	23,700	12,100	18,100	13,100	11,200
19	11,200	8,050	13,600	24,300	40,400	28,400	86,600	23,700	12,100	18,100	14,500	11,200
20	10,800	8,050	13,100	24,300	37,800	26,600	97,500	23,700	12,100	17,600	15,000	11,700
21	10,300	8,050	13,100	24,300	37,800	26,000	99,500	23,100	12,600	15,500	14,500	11,700
22	9,900	8,050	13,100	24,300	37,800	26,600	88,600	23,100	12,600	14,500	13,100	11,200
23	9,900	8,050	13,100	23,100	37,100	26,600	74,400	23,700	13,100	15,000	12,100	11,200
24	9,490	8,050	13,100	23,100	35,800	26,600	64,300	26,600	13,100	15,500	11,200	11,200
25	9,490	8,050	13,100	22,500	35,200	26,600	56,200	26,000	13,100	27,200	10,800	11,200
26	9,490	8,050	14,000	27,800	33,300	26,600	50,900	24,800	13,100	26,000	10,300	11,200
27	9,490	8,050	16,500	33,300	32,100	29,600	46,300	22,500	13,100	26,600	9,900	11,700
28	9,490	8,380	17,600	32,100	30,800	37,800	43,000	21,400	13,100	20,300	9,490	15,500
29	9,490	9,100	18,100	29,600	.....	42,300	40,400	20,300	14,000	17,000	9,490	15,500
30	9,490	9,100	18,100	29,600	.....	42,300	38,400	19,200	18,600	15,000	9,490	13,100
31	9,100	.....	19,700	32,700	.....	42,300	.....	18,600	.....	14,500	9,490	.....
1912.												
1	12,100	15,000	22,500	76,100	84,800	85,400	180,000	154,000	49,400	35,200	26,000	17,600
2	11,200	14,500	21,400	79,800	84,100	72,400	158,000	157,000	42,000	32,100	26,000	16,500
3	11,200	13,600	20,800	71,100	74,200	60,000	159,000	134,000	37,000	31,400	26,000	15,500
4	11,200	13,100	19,700	62,400	60,600	52,500	178,000	99,600	33,300	30,800	28,400	15,000
5	11,200	13,100	18,600	54,400	44,500	48,800	183,000	76,100	31,400	32,700	24,300	14,500
6	11,200	12,600	17,600	46,900	41,400	48,200	177,000	67,400	30,800	34,500	23,100	14,000
7	11,200	13,100	16,500	40,700	37,600	48,200	137,000	63,700	30,800	44,500	22,500	14,000
8	11,700	15,500	16,000	35,800	31,400	53,100	88,500	68,600	32,100	44,500	22,500	13,600
9	14,000	18,100	15,500	35,200	30,200	59,300	73,000	70,500	29,600	43,200	22,500	13,600
10	14,000	20,800	15,000	35,800	28,400	63,700	64,900	64,300	29,000	39,500	22,000	13,100
11	14,000	24,300	14,500	38,900	28,400	71,100	60,000	58,700	27,800	37,600	22,000	13,100
12	14,500	26,000	14,500	37,600	26,600	73,600	55,000	55,000	26,000	45,100	22,000	13,100
13	19,700	27,200	14,500	37,000	26,600	74,800	51,300	50,700	24,300	45,700	21,400	12,600
14	20,800	31,400	15,500	35,200	26,600	70,500	48,200	47,600	20,800	43,800	20,300	12,100
15	20,300	33,300	18,600	32,100	26,000	81,700	45,100	44,500	20,800	38,300	19,200	12,100
16	20,300	30,800	29,000	32,100	30,200	120,000	44,500	42,600	23,100	35,200	19,200	11,700
17	21,400	28,400	37,800	26,000	35,200	144,000	48,200	42,000	23,700	33,300	20,300	11,200
18	30,800	27,200	36,500	24,800	35,800	144,000	54,400	41,400	24,800	31,400	22,000	11,200
19	33,300	27,200	29,600	22,500	34,500	131,000	57,500	41,400	26,000	28,400	21,400	12,100
20	39,700	27,800	26,000	23,700	33,900	105,000	58,100	43,800	24,800	28,400	20,800	13,100
21	41,000	27,800	26,000	26,600	35,800	77,900	51,900	43,800	23,700	29,600	20,800	14,500
22	44,300	27,200	26,000	30,800	63,700	64,900	48,800	39,500	21,400	30,200	21,400	14,500
23	35,800	27,200	35,800	30,800	88,500	54,400	68,600	35,800	20,300	33,300	23,100	20,300
24	27,200	26,000	46,300	32,700	92,800	52,500	92,200	33,300	19,200	33,300	23,700	24,300
25	23,700	24,300	58,300	32,700	89,700	75,500	86,600	31,400	20,300	30,800	28,400	33,900
26	20,800	23,700	60,900	29,600	81,700	92,200	71,100	30,200	26,600	30,200	26,600	27,200
27	20,300	23,100	90,000	27,800	86,000	81,000	61,200	29,600	30,200	29,600	24,300	26,600
28	19,200	23,100	117,000	26,600	105,000	75,500	87,900	28,400	34,500	32,100	22,000	26,600
29	17,600	23,100	118,000	27,800	98,400	121,000	122,000	30,800	36,400	33,300	20,300	26,000
30	16,000	23,100	90,700	50,700	.....	173,000	137,000	44,500	38,300	30,800	19,200	23,700
31	15,500	.....	80,500	79,800	.....	190,000	.....	56,900	.....	27,200	18,100	.....

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Daily discharge, in second-feet, of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1913.												
1	20,300	10,800	9,490	42,000	89,700	135,000	163,000	30,200	58,700	17,000	14,000	9,420
2	18,100	10,300	9,490	46,900	72,400	130,000	102,000	29,600	53,100	16,500	13,500	9,000
3	16,500	10,300	9,490	46,900	62,400	99,600	73,600	29,000	53,100	16,000	13,500	9,000
4	15,000	10,300	9,900	49,400	58,700	76,700	63,700	27,800	49,400	16,500	13,500	9,000
5	14,000	10,300	17,000	46,900	57,500	61,200	57,500	26,600	45,700	16,500	14,000	9,000
6	13,600	10,300	39,500	40,700	57,500	51,900	53,100	26,000	42,600	16,500	14,000	9,000
7	13,100	10,300	55,600	40,100	55,600	46,300	48,800	24,800	42,000	16,500	13,500	8,580
8	12,600	10,300	59,300	95,300	51,900	42,000	45,700	24,800	42,000	16,500	12,100	7,800
9	12,100	11,200	48,800	107,000	46,300	38,900	43,200	24,800	43,200	17,000	11,600	7,800
10	11,700	14,500	39,500	97,800	41,400	37,000	40,700	24,800	42,600	15,500	11,600	7,800
11	11,200	17,000	32,700	86,000	38,900	40,100	38,900	25,400	49,400	14,500	12,500	8,190
12	10,800	18,100	27,200	71,700	45,700	45,700	38,300	25,400	44,500	13,500	14,500	8,190
13	10,800	17,600	24,300	70,500	58,700	49,400	37,600	24,300	38,900	13,500	14,500	8,190
14	10,800	16,000	21,400	70,500	81,700	83,500	39,500	23,700	33,300	15,000	15,000	7,800
15	10,800	14,500	19,700	65,500	69,300	146,000	44,500	22,500	29,000	15,000	14,000	7,430
16	10,800	13,600	18,600	60,600	58,700	182,000	44,500	22,500	26,600	14,000	13,000	7,070
17	12,100	13,600	17,600	53,100	49,400	190,000	47,600	22,500	25,400	13,000	12,100	7,070
18	13,100	12,600	17,600	45,700	44,500	185,000	50,700	22,500	23,700	12,500	12,100	7,070
19	13,100	11,700	17,600	49,400	40,100	154,000	50,000	24,300	23,100	12,100	11,600	7,070
20	13,100	11,700	18,600	60,000	37,000	105,000	47,600	28,400	22,000	11,200	11,600	7,070
21	14,500	11,700	18,600	59,300	37,000	77,300	44,500	31,400	20,800	10,700	11,600	9,000
22	15,000	11,200	18,100	58,700	37,000	76,100	40,700	29,000	20,800	10,300	11,600	9,420
23	14,500	11,200	17,000	61,800	36,400	76,100	37,600	27,800	20,800	9,840	11,200	10,300
24	13,100	10,800	17,000	65,500	35,200	72,400	34,500	38,900	20,800	9,840	11,200	12,500
25	12,600	10,800	18,100	90,300	34,500	65,500	32,700	72,400	20,300	9,840	11,200	12,500
26	12,100	10,300	20,800	119,000	32,100	58,700	31,400	95,300	18,600	9,840	10,700	12,100
27	11,700	10,300	22,000	125,000	33,900	78,600	30,800	95,300	18,100	11,200	10,700	12,100
28	11,700	10,300	22,000	131,000	81,000	154,000	30,200	79,800	18,100	11,600	10,700	10,700
29	11,200	9,900	21,400	140,000	.....	190,000	30,200	66,800	18,100	11,600	10,700	9,840
30	11,200	9,490	21,400	136,000	.....	202,000	30,200	64,900	17,600	13,500	10,700	9,840
31	10,800	.....	28,400	115,000	.....	200,000	.....	67,400	.....	14,500	9,840	.....

Daily discharge, in second-feet, of Tennessee River at Chattanooga, Tenn., Oct. 1–21, 1913.

Day.	Oct.	Day.	Oct.	Day.	Oct.	Day.	Oct.
1	9,420	6	8,590	11	6,720	16	6,060
2	9,420	7	7,800	12	6,380	17	6,060
3	9,420	8	7,430	13	6,380	18	6,060
4	9,420	9	7,070	14	6,380	19	6,060
5	9,000	10	6,720	15	6,060	20	6,060
						21	6,720

Monthly discharge of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913.

[Drainage area, 21,400 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.[a]
	Maximum.	Minimum.	Mean.	Per square mile.		
1874.						
April	190,000	29,600	108,000	5.05	5.63	
May	195,000	22,900	74,600	3.49	4.02	
June	32,800	11,400	20,300	.949	1.06	
July	51,800	9,750	17,200	.804	.93	
August	92,600	7,850	23,000	1.07	1.23	
September	89,200	10,600	19,600	.916	1.02	
The period	195,000	7,850	43,800	2.05	13.89	

[a] See "Accuracy" in station description.

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Monthly discharge of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1875.						
October	27,700	8,210	13,600	0.636	0.73	
November	67,400	6,830	23,800	1.11	1.24	
December	56,600	15,800	34,200	1.60	1.84	
January	215,000	22,900	59,300	2.77	3.19	
February	357,000	37,500	100,000	4.67	4.86	
March	361,000	77,000	179,000	8.36	9.64	
April	133,000	40,900	72,800	3.40	3.79	
May	135,000	19,600	39,500	1.85	2.13	
June	32,100	16,900	24,300	1.14	1.27	
July	130,000	28,300	51,600	2.41	2.78	
August	77,000	22,400	37,000	1.73	1.99	
September	70,200	14,300	23,100	1.08	1.20	
The year	361,000	6,830	54,700	2.56	34.66	
1876.						
October	32,100	12,800	17,300	.808	.93	
November	43,000	13,300	30,700	1.43	1.60	
December	227,000	22,400	58,600	2.74	3.16	
January	205,000	29,600	70,900	3.31	3.82	
February	143,000	43,000	76,000	3.55	3.83	
March	137,000	32,100	67,700	3.16	3.64	
April	85,800	34,800	54,400	2.54	2.83	
May	130,000	39,600	66,100	3.09	3.56	
June	153,000	27,100	57,900	2.71	3.02	
July	46,400	19,000	31,200	1.46	1.68	
August	34,800	14,300	22,000	1.03	1.19	
September	19,000	11,400	13,800	.645	.72	
The year	227,000	11,400	47,200	2.21	29.98	
1877.						
October	19,000	7,850	10,700	.500	.58	
November	21,800	8,580	11,600	.542	.60	
December	19,000	9,350	13,000	.607	.70	
January	178,000	10,600	72,900	3.41	3.93	
February	36,200	17,400	24,400	1.14	1.19	
March	108,000	17,400	55,900	2.61	3.01	
April	189,000	49,800	94,000	4.39	4.90	
May	71,500	19,600	36,900	1.72	1.98	
June	28,900	15,800	19,600	.916	1.02	
July	29,600	11,400	17,500	.818	.94	
August	14,300	8,960	11,300	.528	.61	
September	17,900	9,350	12,900	.603	.67	
The year	189,000	7,850	31,800	1.49	20.13	
1878.						
October	22,400	8,580	13,700	.640	.74	
November	96,000	12,800	37,000	1.73	1.93	
December	51,800	17,900	31,900	1.49	1.72	
January	79,000	27,700	46,500	2.17	2.50	
February	125,000	38,900	63,000	2.94	3.06	
March	66,100	25,900	40,800	1.91	2.20	
April	58,600	23,500	37,000	1.73	1.93	
May	44,300	22,400	32,400	1.51	1.74	
June	22,900	12,800	16,800	.785	.88	
July	15,300	8,210	11,800	.551	.64	
August	23,500	8,580	15,200	.710	.82	
September	66,100	7,500	16,900	.790	.88	
The year	125,000	7,500	30,000	1.40	19.04	
1879.						
October	41,600	7,850	13,400	.626	.72	
November	116,000	11,000	24,600	1.15	1.28	
December	92,600	28,900	55,900	2.61	3.01	
January	252,000	23,500	92,200	4.31	4.97	
February	122,000	40,200	67,200	3.14	3.27	
March	68,800	25,300	37,600	1.76	2.03	
April	53,800	24,700	40,500	1.89	2.11	
May	37,500	16,900	25,200	1.18	1.36	
June	18,500	7,850	12,700	.593	.66	
July	11,400	7,160	8,300	.388	.45	
August	24,100	8,580	15,900	.743	.86	
September	15,800	5,900	9,360	.437	.49	
The year	252,000	5,900	33,400	1.56	21.21	

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Monthly discharge of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1880.						
October	85,100	5,330	19,600	0.916	1.06	
November	27,700	9,750	15,100	.706	.79	
December	143,000	20,700	68,700	3.21	3.70	
January	66,100	23,500	38,600	1.80	2.08	
February	176,000	23,500	56,800	2.65	2.86	
March	254,000	45,700	127,000	5.93	6.84	
April	109,000	38,200	67,700	3.16	3.53	
May	92,600	23,500	41,700	1.95	2.25	
June	36,200	12,800	20,300	.949	1.06	
July	47,000	11,900	20,800	.972	1.12	
August	27,100	10,600	18,800	.879	1.01	
September	22,400	9,350	14,700	.687	.77	
The year	254,000	5,330	42,600	1.99	27.07	
1881.						
October	19,000	7,850	9,900	.463	.53	
November	85,800	8,580	18,200	.850	.95	
December	174,000	25,900	62,700	2.93	3.38	
January	122,000	17,900	60,200	2.81	3.24	
February	146,000	34,100	76,300	3.57	3.72	
March	125,000	35,500	56,800	2.65	3.06	
April	116,000	40,900	62,100	2.90	3.24	
May	53,800	17,900	30,500	1.43	1.65	
June	28,900	12,800	19,600	.916	1.02	
July	20,100	8,580	12,400	.579	.67	
August	18,500	5,330	8,080	.378	.44	
September	72,200	4,800	14,500	.678	.76	
The year	174,000	4,800	35,700	1.67	22.66	
1882.						
October	17,400	5,900	8,880	.415	.48	
November	62,000	17,900	36,900	1.72	1.92	
December	131,000	19,000	64,600	3.02	3.48	
January	267,000	54,500	175,000	8.18	9.43	
February	197,000	57,200	124,000	5.79	6.03	
March	144,000	53,200	86,000	4.02	4.64	
April	70,200	31,500	49,200	2.30	2.57	
May	53,200	25,300	34,100	1.59	1.83	
June	62,000	25,300	37,800	1.77	1.98	
July	40,900	18,500	26,600	1.24	1.43	
August	36,800	13,800	23,900	1.12	1.29	
September	149,000	16,300	40,000	1.87	2.09	
The year	267,000	5,900	58,500	2.73	37.17	
1883.						
October	24,100	10,600	14,000	.654	.75	
November	23,500	10,600	13,600	.636	.71	
December	62,000	12,800	25,500	1.19	1.37	
January	254,000	21,200	96,100	4.49	5.18	
February	114,000	45,000	66,800	3.12	3.25	
March	60,600	28,300	40,400	1.89	2.18	
April	215,000	69,500	119,000	5.56	6.20	
May	68,800	21,800	34,200	1.60	1.84	
June	40,900	17,900	25,300	1.18	1.32	
July	22,900	9,350	15,700	.734	.85	
August	14,800	8,580	10,500	.491	.57	
September	14,300	4,800	7,610	.356	.40	
The year	254,000	4,800	38,800	1.81	24.62	
1884.						
October	35,500	7,500	11,700	.547	.63	
November	68,100	8,960	21,800	1.02	1.14	
December	82,400	14,300	29,800	1.39	1.60	
January	94,600	19,000	52,400	2.45	2.82	
February	244,000	59,300	148,000	6.92	7.46	
March	285,000	47,700	157,000	7.34	8.46	
April	109,000	38,200	68,500	3.20	3.57	
May	71,500	24,100	40,600	1.90	2.19	
June	71,500	19,000	34,900	1.63	1.82	
July	50,400	14,800	27,900	1.30	1.50	
August	60,600	11,000	19,600	.916	1.06	
September	17,900	6,510	9,000	.421	.47	
The year	285,000	6,510	51,500	2.41	32.72	

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Monthly discharge of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1915—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1885.						
October	7,850	5,330	6,080	0.284	0.33	
November	11,000	6,510	7,940	.371	.41	
December	79,700	8,210	25,400	1.19	1.37	
January	174,000	20,100	70,500	3.29	3.79	
February	59,300	28,300	42,100	1.97	2.05	
March	56,600	28,300	39,400	1.84	2.12	
April	99,400	22,900	36,800	1.72	1.92	
May	89,200	19,000	31,300	1.46	1.68	
June	120,000	19,000	35,500	1.66	1.85	
July	31,500	15,800	20,500	.958	1.10	
August	24,700	8,960	15,400	.720	.83	
September	12,800	6,830	9,750	.456	.51	
The year	174,000	5,330	28,300	1.32	17.96	
1886.						
October	99,400	11,900	26,300	1.23	1.42	
November	201,000	24,700	66,400	3.10	3.46	
December	140,000	25,900	53,500	2.50	2.88	
January	144,000	28,900	76,700	3.58	4.13	
February	83,100	31,500	49,200	2.30	2.40	
March	269,000	28,300	61,300	2.86	3.30	
April	349,000	34,800	136,000	6.36	7.10	
May	67,400	32,800	50,400	2.36	2.72	
June	103,000	43,000	64,400	3.01	3.36	
July	87,800	25,900	50,000	2.34	2.70	
August	42,300	19,600	28,500	1.33	1.53	
September	19,000	11,900	15,200	.710	.79	
The year	349,000	11,900	56,400	2.64	35.79	
1887.						
October	11,900	8,580	10,000	.467	.54	
November	87,200	9,350	30,300	1.42	1.58	
December	107,000	22,400	49,000	2.29	2.64	
January	142,000	28,300	58,100	2.71	3.12	
February	180,000	52,500	99,700	4.66	4.85	
March	180,000	29,600	66,700	3.12	3.60	
April	138,000	23,500	45,100	2.11	2.35	
May	38,900	25,900	30,800	1.44	1.66	
June	64,700	20,700	38,700	1.81	2.02	
July	32,100	11,400	18,900	.883	1.02	
August	66,100	18,500	27,800	1.30	1.50	
September	22,400	8,960	11,900	.556	.62	
The year	180,000	8,580	40,200	1.88	25.50	
1888.						
October	26,500	8,580	13,600	.636	.73	
November	16,900	9,350	11,700	.547	.61	
December	31,500	10,200	18,800	.879	1.01	
January	169,000	32,100	71,700	3.35	3.86	
February	70,200	29,600	47,900	2.24	2.42	
March	178,000	27,100	53,800	2.51	2.89	
April	154,000	25,900	62,000	2.90	3.24	
May	59,300	22,400	32,500	1.52	1.75	
June	56,600	15,800	28,600	1.34	1.50	
July	42,300	11,000	19,400	.907	1.04	
August	36,200	11,900	16,900	.790	.91	
September	72,200	19,600	46,800	2.19	2.44	
The year	178,000	8,580	35,200	1.64	22.40	
1889.						
October	130,000	15,800	39,500	1.85	2.13	
November	137,000	30,800	67,400	3.15	3.51	
December	40,900	22,400	28,100	1.31	1.51	
January	89,200	31,500	60,300	2.82	3.25	
February	195,000	36,200	87,300	4.08	4.25	
March	58,600	17,900	37,500	1.75	2.02	
April	49,800	17,900	29,600	1.38	1.54	
May	28,300	15,300	20,400	.953	1.10	
June	76,300	21,800	42,200	1.97	2.20	
July	56,600	19,600	31,600	1.48	1.71	
August	62,700	21,200	36,900	1.72	1.98	
September	48,400	13,800	29,600	1.38	1.54	
The year	195,000	13,800	42,100	1.97	26.74	

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Monthly discharge of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1890.						
October	27,100	12,400	15,100	0.706	0.81	
November	70,800	15,300	47,900	2.24	2.50	
December	46,400	19,600	26,700	1.25	1.44	
January	82,400	25,900	40,600	1.90	2.19	
February	231,000	42,300	75,100	3.51	3.66	
March	283,000	52,500	117,000	5.47	6.31	
April	133,000	40,900	66,500	3.11	3.47	
May	74,900	38,900	50,500	2.36	2.72	
June	35,500	17,400	24,400	1.14	1.27	
July	46,400	11,900	21,800	1.02	1.18	
August	45,000	14,300	26,600	1.24	1.43	
September	45,700	15,800	23,100	1.08	1.20	
The year	283,000	11,900	44,400	2.07	28.18	
1891.						
October	58,600	20,700	35,000	1.64	1.89	
November	40,200	13,800	21,000	.981	1.09	
December	81,700	13,300	32,500	1.52	1.75	
January	99,400	36,800	60,200	2.81	3.24	
February	249,000	60,600	147,000	6.87	7.15	
March	259,000	64,700	124,000	5.79	6.68	
April	105,000	36,200	63,300	2.96	3.30	
May	34,100	21,200	25,900	1.21	1.40	
June	45,700	21,800	33,000	1.54	1.72	
July	32,800	15,300	21,200	.991	1.14	
August	106,000	16,900	37,800	1.77	2.04	
September	33,500	11,500	20,200	.944	1.05	
The year	259,000	11,500	51,200	2.39	32.45	
1892.						
October	11,500	9,350	10,300	.481	.55	
November	39,600	8,580	16,900	.789	.88	
December	68,100	15,800	36,500	1.71	1.97	
January	252,000	38,900	94,100	4.40	5.07	
February	72,200	30,200	45,400	2.12	2.29	
March	66,100	28,300	44,200	2.07	2.39	
April	227,000	38,200	96,400	4.51	5.03	
May	53,200	27,100	37,200	1.74	2.01	
June	57,200	24,100	41,200	1.93	2.15	
July	74,200	21,200	42,700	1.99	2.29	
August	27,700	15,300	19,600	.916	1.06	
September	25,300	8,960	14,500	.678	.76	
The year	252,000	8,580	41,500	1.94	26.45	
1893.						
October	12,800	8,210	9,430	.441	.51	
November	41,600	8,210	22,700	1.06	1.18	
December	57,200	14,800	28,700	1.34	1.54	
January	42,300	16,300	21,500	1.00	1.15	
February	221,000	35,000	101,600	4.72	4.92	
March	75,600	32,800	49,400	2.31	2.66	
April	76,300	27,100	40,000	1.87	2.09	
May	196,000	25,900	70,600	3.30	3.80	
June	135,000	22,900	48,800	2.28	2.54	
July	31,500	14,800	20,200	.944	1.09	
August	29,600	10,200	17,300	.808	.93	
September	80,400	13,800	30,000	1.41	1.57	
The year	221,000	8,210	37,800	1.77	23.98	
1894.						
October	59,300	10,600	19,900	.930	1.07	
November	27,100	13,300	15,800	.738	.82	
December	26,500	14,300	19,400	.907	1.05	
January	58,600	16,300	34,300	1.61	1.86	
February	167,000	27,700	73,400	3.43	3.57	
March	60,000	29,600	45,400	2.12	2.44	
April	51,800	22,400	32,900	1.54	1.72	
May	42,300	17,900	26,900	1.26	1.45	
June	24,100	11,900	15,400	.720	.80	
July	24,700	11,000	18,700	.874	1.01	
August	25,900	11,000	16,700	.781	.90	
September	22,400	7,160	11,100	.519	.58	
The year	167,000	7,160	27,200	1.27	17.27	

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Monthly discharge of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1895.						
October	13,800	6,830	8,590	0.401	0.46	B.
November	13,300	6,830	8,420	.393	.44	B.
December	70,200	7,500	25,900	1.21	1.40	C.
January	212,000	17,400	72,800	3.40	3.92	B.
February	45,700	18,500	33,600	1.57	1.64	B.
March	148,000	40,200	75,200	3.51	4.05	B.
April	82,400	34,100	50,300	2.35	2.62	B.
May	58,600	30,800	42,000	1.96	2.26	B.
June	32,100	14,300	21,200	.991	1.10	B.
July	64,700	13,800	25,000	1.17	1.35	B.
August	35,500	15,300	21,800	1.02	1.18	B.
September	19,000	7,500	13,000	.608	.68	B.
The year	212,000	6,830	33,300	1.56	21.10	
1896.						
October	7,850	6,830	7,320	.342	.39	C.
November	13,800	8,210	9,760	.456	.51	B.
December	29,600	8,960	14,400	.673	.78	B.
January	49,800	13,300	23,500	1.10	1.27	B.
February	89,200	23,500	55,400	2.59	2.79	B.
March	101,000	19,000	37,600	1.76	2.03	B.
April	269,000	20,100	71,400	3.34	3.73	B.
May	25,900	12,400	17,800	.832	.96	B.
June	41,600	14,800	21,400	1.00	1.12	B.
July	141,000	17,400	56,500	2.64	3.04	B.
August	31,500	12,800	19,500	.911	1.05	B.
September	15,800	8,580	10,900	.509	.57	B.
The year	269,000	6,830	28,700	1.34	18.24	
1897.						
October	16,900	8,210	10,400	.486	.56	B.
November	57,900	8,580	20,400	.953	1.06	B.
December	88,500	14,300	31,200	1.46	1.68	B.
January	43,600	13,800	25,400	1.19	1.37	B.
February	231,000	16,900	84,600	3.95	4.11	C.
March	252,000	52,500	144,000	6.75	7.78	C.
April	201,000	33,500	78,200	3.65	4.07	B.
May	146,000	23,500	50,900	2.38	2.74	B.
June	35,500	18,500	26,100	1.22	1.36	A.
July	77,000	19,000	31,900	1.49	1.72	A.
August	31,500	12,400	19,600	.916	1.06	A.
September	12,800	6,830	8,640	.404	.45	A.
The year	252,000	6,830	44,100	2.06	27.96	
1898.						
October	11,900	5,900	7,960	.372	.43	B.
November	8,960	6,830	7,550	.353	.39	C.
December	63,400	7,850	22,400	1.05	1.21	B.
January	118,000	14,800	57,100	2.67	3.08	B.
February	45,700	17,900	23,700	1.11	1.16	B.
March	83,800	15,800	25,000	1.17	1.35	B.
April	115,000	37,500	57,300	2.68	2.99	B.
May	37,500	19,000	24,300	1.14	1.31	B.
June	32,100	10,200	17,000	.794	.88	B.
July	47,700	11,900	20,600	.963	1.11	A.
August	101,000	21,200	48,400	2.26	2.61	A.
September	164,000	19,000	46,000	2.15	2.40	B.
The year	164,000	5,900	29,800	1.39	18.92	
1899.						
October	109,000	17,900	42,800	2.00	2.31	A.
November	40,200	21,800	28,400	1.33	1.48	C.
December	34,800	20,100	28,700	1.34	1.54	B.
January	122,000	27,100	50,300	2.35	2.71	B.
February	254,000	32,100	103,000	4.81	5.01	B.
March	266,000	59,300	155,000	7.24	8.35	B.
April	149,000	41,600	74,400	3.48	3.88	B.
May	70,200	23,500	43,000	2.01	2.32	B.
June	37,500	16,900	24,500	1.14	1.27	C.
July	29,600	11,000	16,100	.752	.87	B.
August	23,500	8,580	12,600	.589	.68	B.
September	16,900	7,850	10,700	.500	.56	B.
The year	266,000	7,850	48,800	2.28	30.98	

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Monthly discharge of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1915—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1900.						
October	11,000	7,160	8,380	0.392	0.45	B.
November	11,000	7,160	8,760	.409	.46	B.
December	44,300	9,350	23,200	1.08	1.24	B.
January	57,900	12,400	30,400	1.42	1.64	B.
February	157,000	14,300	55,900	2.61	2.72	B.
March	112,000	45,700	70,800	3.31	3.82	B.
April	75,600	35,500	49,700	2.32	2.59	C.
May	36,200	16,900	22,500	1.05	1.21	B.
June	56,600	15,800	35,200	1.64	1.83	C.
July	53,800	14,300	26,300	1.23	1.42	B.
August	36,200	10,600	15,500	.724	.83	B.
September	26,500	7,850	14,300	.668	.75	B.
The year	157,000	7,160	29,900	1.40	18.96	
1901.						
October	45,000	8,580	15,300	.715	.82	B.
November	100,000	11,400	27,000	1.26	1.41	B.
December	56,600	18,500	30,700	1.43	1.65	B.
January	185,000	21,200	53,100	2.48	2.86	B.
February	62,700	20,700	38,400	1.79	1.86	B.
March	146,000	20,700	47,300	2.21	2.55	B.
April	174,000	40,200	99,500	4.65	5.19	A.
May	215,000	27,700	71,900	3.36	3.87	B.
June	75,600	35,500	49,900	2.33	2.60	A.
July	38,900	15,800	25,400	1.19	1.37	A.
August	217,000	14,800	79,400	3.71	4.28	A.
September	64,000	24,100	40,700	1.91	2.13	A.
The year	217,000	8,580	48,200	2.25	30.59	
1902.						
October	27,100	14,300	20,400	.953	1.10	B.
November	14,800	12,400	14,000	.654	.73	B.
December	248,000	12,800	68,800	3.22	3.71	B.
January	271,000	28,900	73,900	3.45	3.98	B.
February	152,000	29,600	62,900	2.94	3.06	B.
March	252,000	43,000	113,000	5.28	6.09	B.
April	204,000	29,600	57,400	2.68	2.99	B.
May	57,200	22,400	29,800	1.39	1.60	B.
June	28,300	16,900	20,500	.958	1.07	C.
July	63,400	11,400	23,800	1.11	1.28	C.
August	15,800	9,350	11,500	.537	.62	C.
September	20,100	8,580	12,100	.565	.63	C.
The year	271,000	8,580	42,400	1.98	26.86	
1903.						
October	21,800	8,580	14,200	.664	.77	B.
November	36,800	8,960	14,000	.654	.73	B.
December	59,300	19,000	35,500	1.66	1.91	B.
January	49,800	22,400	31,700	1.48	1.71	A.
February	193,000	27,100	94,400	4.41	4.59	B.
March	205,000	55,200	115,000	5.37	6.19	A.
April	210,000	56,600	105,000	4.91	5.48	A.
May	55,200	19,600	30,300	1.42	1.64	A.
June	72,900	22,900	40,400	1.89	2.11	A.
July	32,800	12,800	21,500	1.01	1.16	A.
August	27,700	10,200	17,200	.804	.93	A.
September	10,600	6,510	8,460	.395	.44	A.
The year	210,000	6,510	43,500	2.03	27.66	
1904.						
October	9,750	6,510	7,390	.345	.40	A.
November	33,400	7,160	12,600	.589	.66	A.
December	26,500	7,500	12,500	.584	.67	A.
January	66,100	9,750	21,300	.995	1.15	A.
February	55,200	13,300	28,300	1.32	1.38	B.
March	142,000	33,400	64,500	3.01	3.47	B.
April	55,200	20,700	29,500	1.38	1.54	B.
May	45,700	14,800	27,400	1.28	1.48	B.
June	27,700	11,900	17,600	.822	.92	A.
July	24,100	10,600	15,900	.743	.86	A.
August	22,900	12,800	16,700	.780	.90	A.
September	13,800	6,510	9,170	.429	.48	A.
The year	142,000	6,510	21,900	1.02	13.91	

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Monthly discharge of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1915—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1905.						
October	6,830	5,060	5,510	0.257	0.30	A.
November	8,210	5,060	7,070	.330	.37	A.
December	63,400	8,210	20,500	.958	1.10	B.
January	111,000	13,800	36,500	1.71	1.97	B.
February	146,000	15,800	73,200	3.42	3.56	B.
March	112,000	27,700	48,100	2.25	2.59	A.
April	47,000	24,100	32,100	1.50	1.67	A.
May	87,200	28,900	46,900	2.19	2.52	A.
June	34,800	16,300	24,100	1.13	1.26	A.
July	80,400	21,200	34,100	1.59	1.83	B.
August	54,500	15,800	30,700	1.43	1.65	B.
September	19,600	9,350	14,400	.673	.75	A.
The year	146,000	5,060	30,900	1.44	19.57	
1906.						
October	20,700	8,960	13,100	.612	.71	A.
November	14,800	8,580	10,200	.477	.53	A.
December	68,800	9,750	43,500	2.03	2.34	A.
January	140,000	28,300	60,600	2.83	3.26	B.
February	59,300	24,700	34,100	1.59	1.66	A.
March	87,200	28,900	47,300	2.21	2.55	B.
April	94,600	29,600	48,700	2.28	2.54	A.
May	54,500	18,500	28,600	1.34	1.54	A.
June	56,600	17,900	30,400	1.42	1.58	A.
July	96,000	19,600	44,300	2.07	2.39	A.
August	60,000	26,500	41,800	1.95	2.25	B.
September	82,400	27,100	49,600	2.32	2.59	A.
The year	140,000	8,580	37,800	1.77	23.94	
1907.						
October	125,000	26,500	58,900	2.75	3.17	A.
November	220,000	19,600	56,300	2.63	2.93	B.
December	105,000	28,900	40,100	1.87	2.16	B.
January	133,000	28,900	47,500	2.22	2.56	B.
February	70,200	24,700	41,800	1.95	2.03	B.
March	119,000	28,300	62,700	2.93	3.38	B.
April	70,200	32,100	47,200	2.21	2.47	B.
May	79,000	24,700	41,900	1.96	2.26	B.
June	98,000	25,300	52,800	2.47	2.76	B.
July	44,300	18,500	26,800	1.25	1.44	B.
August	33,400	16,300	21,100	.986	1.14	B.
September	66,100	12,400	23,900	1.12	1.25	B.
The year	220,000	12,400	43,400	2.03	27.55	
1908.						
October	32,100	11,900	16,400	.766	.88	B.
November	86,500	11,900	37,600	1.76	1.96	B.
December	93,300	19,600	34,500	1.61	1.86	A.
January	132,000	32,100	71,000	3.32	3.83	B.
February	162,000	40,200	69,700	3.26	3.52	B.
March	108,000	43,600	62,800	2.93	3.38	A.
April	91,200	33,400	52,300	2.44	2.72	A.
May	77,000	27,100	45,000	2.10	2.42	B.
June	36,200	18,500	30,300	1.42	1.58	B.
July	43,600	15,800	24,600	1.15	1.33	B.
August	46,400	15,800	25,300	1.18	1.36	C.
September	27,700	9,750	15,500	.724	.81	B.
The year	162,000	9,750	40,300	1.88	25.65	
1909.						
October	28,300	8,960	12,600	.589	.68	B.
November	36,800	13,300	18,200	.850	.95	C.
December	89,200	13,300	45,100	2.11	2.43	B.
January	106,000	32,100	52,800	2.47	2.85	B.
February	141,000	30,800	83,900	3.92	4.08	B.
March	161,000	46,400	90,100	4.21	4.85	B.
April	104,000	33,300	49,800	2.33	2.60	A.
May	160,000	33,900	71,400	3.34	3.85	A.
June	163,000	38,400	72,000	3.36	3.75	A.
July	117,000	25,400	50,500	2.36	2.72	A.
August	81,200	17,000	34,500	1.61	1.86	B.
September	30,200	14,000	17,800	.832	.93	B.
The year	163,000	8,960	49,700	2.32	31.55	

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Monthly discharge of Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy
	Maximum.	Minimum.	Mean.	Per square mile.		
1910.						
October	33,900	11,200	15,800	0.738	0.85	A.
November	11,700	9,900	10,600	.495	.55	B.
December	32,700	9,900	18,900	.883	1.02	B.
January	70,300	12,100	35,200	1.64	1.89	A.
February	85,900	23,100	38,800	1.81	1.88	A.
March	83,900	19,200	36,100	1.69	1.95	A.
April	46,300	14,500	23,700	1.11	1.24	A.
May	82,500	22,500	44,900	2.10	2.42	A.
June	54,900	30,800	39,200	1.83	2.04	A.
July	70,300	26,000	42,300	1.98	2.28	A.
August	47,000	15,500	25,100	1.17	1.35	A.
September	53,600	12,600	23,400	1.09	1.22	A.
The year	85,900	9,900	29,500	1.38	18.69	
1911.						
October	16,500	9,100	12,100	.565	.65	A.
November	9,100	8,050	8,420	.393	.44	A.
December	63,600	9,900	21,000	.981	1.13	A.
January	161,000	22,500	51,100	2.39	2.76	C.
February	154,000	30,800	62,100	2.90	3.02	C.
March	127,000	25,400	42,400	1.98	2.28	B.
April	195,000	30,800	90,100	4.21	4.70	C.
May	71,000	18,600	32,700	1.53	1.76	B.
June	18,600	12,100	14,700	.687	.77	B.
July	27,200	12,600	16,700	.780	.90	B.
August	18,600	9,490	13,600	.636	.73	B.
September	16,500	9,490	12,800	.598	.67	C.
The year	195,000	8,050	31,200	1.46	19.81	
1912.						
October	44,300	11,200	20,500	.958	1.10	C.
November	33,300	12,600	22,700	1.06	1.18	B.
December	118,000	14,500	37,700	1.76	2.03	C.
January	79,800	22,500	40,100	1.87	2.16	B.
February	105,000	26,000	53,900	2.52	2.72	B.
March	190,000	48,200	86,000	4.02	4.64	B.
April	183,000	44,500	91,600	4.28	4.78	B.
May	157,000	28,400	58,900	2.75	3.17	B.
June	49,400	19,200	28,600	1.34	1.50	B.
July	45,700	27,200	34,700	1.62	1.87	B.
August	28,400	18,100	22,600	1.06	1.22	B.
September	33,900	11,200	16,900	.790	.88	B.
The year	190,000	11,200	42,800	2.00	27.25	
1913.						
October	20,300	10,800	13,000	.607	.70	B.
November	18,100	9,490	12,000	.561	.63	B.
December	59,300	9,490	23,800	1.11	1.28	B.
January	140,000	40,100	75,700	3.54	4.08	B.
February	89,700	32,100	51,600	2.41	2.51	C.
March	202,000	37,000	102,000	4.77	5.50	B.
April	163,000	30,200	49,100	2.29	2.56	B.
May	95,300	22,500	38,000	1.78	2.05	B.
June	58,700	17,600	32,700	1.53	1.71	B.
July	17,000	9,840	13,600	.636	.73	B.
August	15,000	9,840	12,300	.575	.66	B.
September	12,500	7,070	9,000	.421	.47	B.
The year	202,000	7,070	36,000	1.68	22.88	

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Discharge and horsepower table for Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913.

Discharge in second-feet.	Theoretical horsepower per foot of fall.	Days of deficient discharge.									
		1874 [a]	1875	1876	1877	1878	1879	1880	1881	1882	1883
4,800	545	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5,000	568	.....	.....	.....	.....	.....	.....	.....	4	.....	1
5,200	591	.....	.....	.....	.....	.....	.....	.....	7	.....	7
5,400	614	.....	.....	.....	.....	.....	.....	6	12	.....	10
5,600	636	.....	.....	.....	.....	.....	.....	6	12	.....	10
5,800	659	.....	.....	.....	.....	.....	.....	10	13	.....	11
6,000	682	.....	.....	.....	.....	.....	4	10	15	1	13
6,200	705	.....	.....	.....	.....	.....	4	10	15	1	13
6,400	727	.....	.....	.....	.....	.....	6	10	20	3	15
6,600	750	.....	.....	.....	.....	.....	7	10	25	6	16
6,800	773	.....	.....	.....	.....	.....	7	10	25	6	16
7,000	795	.....	2	.....	.....	.....	8	10	28	8	18
7,200	830	.....	3	.....	.....	.....	11	10	32	12	19
7,600	864	.....	3	.....	.....	2	19	10	36	15	20
8,000	909	2	5	.....	3	3	36	10	44	18	20
8,500	966	3	6	.....	9	5	43	10	54	20	21
9,000	1,020	5	10	.....	16	14	63	13	67	24	28
9,500	1,080	6	12	.....	30	19	65	16	74	24	33
10,000	1,140	8	16	.....	45	22	69	19	77	24	40
11,000	1,250	14	20	.....	64	32	82	28	86	25	54
12,000	1,360	27	30	6	100	48	105	41	100	26	85
14,000	1,590	47	36	32	138	80	129	68	121	29	108
16,000	1,820	56	53	53	162	105	148	93	134	34	138
20,000	2,270	81	77	75	214	148	172	127	157	53	166
25,000	2,840	107	112	99	243	177	198	172	191	92	201
30,000	3,410	121	160	131	260	217	218	197	202	135	222
35,000	3,980	131	188	157	277	237	239	230	217	173	243
40,000	4,550	136	208	188	280	268	255	243	235	201	257
50,000	5,680	141	248	249	303	322	297	272	273	227	275
Over 50,000	Over 5,680	183	365	366	365	365	365	366	365	365	365

Discharge in second-feet.	Theoretical horsepower per foot of fall.	Days of deficient discharge.									
		1884	1885	1886	1887	1888	1889	1890	1891	1892	1893
4,800	545	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5,000	568	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5,200	591	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5,400	614	.....	9	.....	.....	.....	.....	.....	.....	.....	.....
5,600	636	.....	9	.....	.....	.....	.....	.....	.....	.....	.....
5,800	659	.....	13	.....	.....	.....	.....	.....	.....	.....	.....
6,000	682	.....	18	.....	.....	.....	.....	.....	.....	.....	.....
6,200	705	.....	18	.....	.....	.....	.....	.....	.....	.....	.....
6,400	727	.....	21	.....	.....	.....	.....	.....	.....	.....	.....
6,600	750	3	25	.....	.....	.....	.....	.....	.....	.....	.....
6,800	773	3	25	.....	.....	.....	.....	.....	.....	.....	.....
7,000	795	6	37	.....	.....	.....	.....	.....	.....	.....	.....
7,200	830	9	41	.....	.....	.....	.....	.....	.....	.....	.....
7,600	864	15	44	.....	.....	.....	.....	.....	.....	.....	.....
8,000	909	19	56	.....	.....	.....	.....	.....	.....	.....	.....
8,500	966	22	63	.....	.....	.....	.....	.....	.....	.....	7
9,000	1,020	33	75	.....	11	6	.....	.....	.....	11	17
9,500	1,080	37	81	.....	30	12	.....	.....	.....	14	22
10,000	1,140	45	89	.....	37	17	.....	.....	.....	27	27
11,000	1,250	53	95	.....	50	33	.....	.....	.....	39	35
12,000	1,360	69	106	5	69	56	.....	1	3	52	41
14,000	1,590	80	115	16	79	71	1	21	14	64	49
16,000	1,820	93	124	28	85	91	9	39	27	76	69
20,000	2,270	128	154	46	105	132	34	69	59	99	126
25,000	2,840	157	201	63	133	173	99	130	133	129	163
30,000	3,410	184	239	94	195	212	158	173	169	152	197
35,000	3,980	205	275	138	234	240	201	192	194	190	233
40,000	4,550	220	293	167	248	258	229	204	207	215	256
50,000	5,680	242	320	219	271	297	282	256	256	273	287
Over 50,000	Over 5,680	366	365	365	365	366	365	365	365	366	365

[a] Apr. 1 to Sept. 30.

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Discharge and horsepower table for Tennessee River at Chattanooga, Tenn., for the years ending Sept. 30, 1874–1913—Continued.

Discharge in second-feet.	Theoretical horsepower per foot of fall.	Days of deficient discharge.									
		1894	1895	1896	1897	1898	1899	1900	1901	1902	1903
4,800	545	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5,000	568	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5,200	591	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5,400	614	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5,600	636	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5,800	659	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
6,000	682	.....	.....	.....	.....	4	.....	.....	.....	.....	.....
6,200	705	.....	.....	.....	.....	4	.....	.....	.....	.....	.....
6,400	727	.....	.....	.....	.....	7	.....	.....	.....	.....	.....
6,600	750	.....	.....	.....	.....	9	.....	.....	.....	.....	1
6,800	773	.....	.....	.....	.....	9	.....	.....	.....	.....	1
7,000	795	.....	4	8	3	20	.....	.....	.....	.....	3
7,300	830	1	15	17	10	31	.....	7	.....	.....	4
7,600	864	2	30	23	14	33	.....	9	.....	.....	4
8,000	909	3	41	31	17	39	3	23	.....	.....	7
8,500	966	4	50	34	19	41	3	39	.....	.....	13
9,000	1,020	7	61	55	36	55	14	50	5	3	31
9,500	1,080	10	65	65	39	59	18	56	8	12	40
10,000	1,140	14	69	75	43	60	21	60	10	26	45
11,000	1,250	18	74	89	55	63	26	74	13	32	53
12,000	1,360	33	79	103	58	77	44	91	22	46	69
14,000	1,590	60	94	125	73	91	63	115	31	73	82
16,000	1,820	110	112	150	97	111	75	134	46	107	94
20,000	2,270	174	157	202	124	160	96	173	64	147	117
25,000	2,840	229	189	248	181	226	134	206	109	185	175
30,000	3,410	265	213	281	205	252	175	227	145	219	209
35,000	3,980	283	237	291	230	273	215	244	188	243	229
40,000	4,550	294	255	301	253	288	231	264	213	260	243
50,000	5,680	333	291	316	274	306	261	301	251	284	268
Over 50,000	Over 5,680	365	365	366	365	365	365	365	365	365	365

Discharge in second-feet.	Theoretical horsepower per foot of fall.	Days of deficient discharge.									
		1904	1905	1906	1907	1908	1909	1910	1911	1912	1913
4,800	545	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5,000	568	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5,200	591	.....	13	.....	.....	.....	.....	.....	.....	.....	.....
5,400	614	.....	22	.....	.....	.....	.....	.....	.....	.....	.....
5,600	636	.....	22	.....	.....	.....	.....	.....	.....	.....	.....
5,800	659	.....	27	.....	.....	.....	.....	.....	.....	.....	.....
6,000	682	.....	30	.....	.....	.....	.....	.....	.....	.....	.....
6,200	705	.....	30	.....	.....	.....	.....	.....	.....	.....	.....
6,400	727	.....	34	.....	.....	.....	.....	.....	.....	.....	.....
6,600	750	14	40	.....	.....	.....	.....	.....	.....	.....	.....
6,800	773	14	40	.....	.....	.....	.....	.....	.....	.....	.....
7,000	795	18	43	.....	.....	.....	.....	.....	.....	.....	.....
7,300	830	26	45	.....	.....	.....	.....	.....	.....	.....	5
7,600	864	42	50	.....	.....	.....	.....	.....	.....	.....	6
8,000	909	56	59	.....	.....	.....	.....	.....	.....	.....	10
8,500	966	62	62	.....	.....	.....	.....	.....	17	.....	13
9,000	1,020	79	62	8	.....	.....	2	.....	28	.....	14
9,500	1,080	83	67	13	.....	.....	10	.....	44	.....	26
10,000	1,140	88	69	24	.....	1	13	13	48	.....	35
11,000	1,250	98	76	37	.....	5	15	26	55	.....	63
12,000	1,360	114	83	46	.....	24	19	42	72	10	88
14,000	1,590	149	94	52	8	33	31	63	123	26	121
16,000	1,820	177	104	55	14	42	54	85	158	47	141
20,000	2,270	217	141	72	37	82	84	130	204	65	173
25,000	2,840	273	174	101	87	118	94	171	226	121	200
30,000	3,410	291	220	139	123	145	117	212	260	172	215
35,000	3,980	315	257	178	176	194	144	257	274	215	229
40,000	4,550	326	282	208	211	221	164	285	291	241	246
50,000	5,680	345	314	278	262	270	228	323	310	273	286
Over 50,000	Over 5,680	366	365	365	365	366	365	365	365	366	365

NOTE.—The above table gives the theoretical horsepower per foot fall that may be developed at different rates of discharge, and shows the number of days on which the discharge and corresponding horsepower were respectively less than the amounts given in the columns for discharge and horsepower. In using this table, allowance should be made for the various losses, the principal ones being the wheel loss, which may be as large as 20 per cent, and the head loss, which may be as large as 5 per cent.

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TENNESSEE RIVER AT FLORENCE, ALA.

Location.—At Southern Railway bridge about 1 mile south of Florence, Ala., just below foot of Little Muscle Shoals and lower end of Patton's Island; 8 miles below mouth of Shoal Creek, about 3 miles above upper end of Seven Mile Island, 208 miles below Chattanooga, Tenn., and 256 miles above mouth of the Tennessee.

Records available.—November 7, 1871, to September 30, 1913. Data relating to the shoals in Tennessee River near Florence are given in U. S. Geol. Survey, Twenty-second Ann. Rept., pt. 4, pp. 229–230.

Drainage area.—30,800 square miles.

Gage.—Present gage consists of four sections of steel, three-eighths inch by 7½ inches, attached to face of stone draw pier, which has a batter of 1 inch to the foot. These sections form one continuous gage, graduated from −1.92 to 33.5 feet. The zero of the gage is 400.85 feet above sea level.

Descriptions of the gages maintained at Florence and notes of inspections are given in "Stages of the Mississippi River and of its principal tributaries," published by the Mississippi River Commission. Descriptions of the station appear also in "Daily river stages," published by the United States Weather Bureau.

The gage at Florence was established November 6, 1871, and the zero set at the level of the low water of 1871, said to have occurred during October, elevation 30.19 feet below Merrill B. M. No. 1, the same elevation as the zero of the present gage. (For later information from Mississippi River Commission see pages 259–261.)

"Stages of the Mississippi River and of its principal tributaries" for 1892 states: "Gage is vertical type, located on the downstream face of approach wall, Florence side, of the Memphis & Charleston Railroad bridge." The report for 1893 states: "Vertical gage in three sections, located at Florence end railroad bridge; sections 1 and 2 (34 to 18, 19 to 9.1) are attached to lower face of rock approach to bridge. Section 3 (10.0 to 0.0) is driven in the ground on upper side of approach to which sections 1 and 2 are fastened."

These descriptions of the gage are the first published and no doubt refer to the same gage, for there is no record of an inspection during 1892 or 1893, but this gage is evidently not the one established November 6, 1871, although the elevation of the zero is the same in all cases.

The gage observer's record contains the following notes:

September 16, 1879: Lower section of gage torn out by Government barge.
September 23, 1879: Replaced by Mr. Turtle, United States engineer. Mr. Turtle says gage "0" was high about one-half inch.
November 19, 1880: Gage rebuilt by W. M. Reese. Gage below 3 feet reads −0.04 too high.
June 21, 1881: Lower section knocked out at 9 a. m. by Government barge.
June 25, 1881: Replaced by man from Memphis.
June 19, 1882: Lower section of gage knocked out at 7.30 a. m.
June 26, 1882: Replaced by man from Memphis.
November 1, 1882: Emmet Coburn, gage reader.

The following statements are taken from the record of inspections:

January 26, 1887: Gage intact, old, and needs rebuilding.
March 22, 1887: Gage of two sections—vertical 19 to 34 feet, inclined 19 to 0 feet. Error in vertical portion—0.84 feet, i. e., gage too high. Various errors of equal amount found in inclined portion of gage. "John Ewens, U. S. Asst. Engineer." Note.—L. L. Wheeler thinks Ewens used wrong B. M.
July 14, 1887: Inspected gage and records and find all in good condition, except gage is old and will need replacing by new structure. Inclined portion of gage averages 0.1 too low. (Corrections were made in record before printing.)
December 20, 1887: Inspected gage and records; found both in good condition. "C. W. Clark, U. S. Army Engineer."

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August 18, 1889: Gage rebuilt; vertical type, in four sections, 34.0 to 18 feet, 19 to 9 feet, 10 to 6.2 feet, 6.2 to 0 feet. The following elevations of marks on original inclined section, referred to B. M. No. 1, were found:

Mark.	Elevation.	Mark.	Elevation.
15.00	14.73	6.00	5.94
11.00	10.90	4.30	4.41
8.00	7.97	31.00	31.01

April 19, 1890: Gage inspected; no errors found.

It should be noted that the stage of the river at the time of this inspection was greater than 6.0 feet.

"Stages of the Mississippi River and of its principal tributaries" for 1894 states:

Inspected October 23. * * * It was found that the readings on low-water section below 6 feet were unduly affected by bridge approach piling put in since previous inspection, hence the new low-water section was put in about 50 feet downstream and is on line with higher portions of gage. Water surface at former location was found to be 0.83 foot too high as compared with present location.

This correction was not made in the published records of the Mississippi River Commission.

The inspection record states:

October 23, 1894: Gage keeper's record for October found to be in error, due to his assuming that the gage zero began at +0.76 foot reading in stage, and recorded all readings below that mark as negative. For example, on October 3, when the gage actually read +0.7 foot, which was +0.06 foot below +0.76, he read it (−0.06 foot). He was instructed in the matter. All negative readings to this date should be corrected by subtracting them from +0.76 foot.

This correction was made in the published records of the Mississippi River Commission.

October 23, 1894: Water surface by gage +0.75 foot.

Gage.	Elevation.	Section.
31.52	31.52	18–34
9.0	9.04	6–10
5.0	5.06	2–6
2.0	2.09	0–2

Gage disturbed by heavy drift and boats. Disturbed portions, 9.1 to 0.0; rebuilt, −2.0 to 21.0; section 18–34 was rebraced.

Records of inspections subsequent to 1894 can be found in "Stages of the Mississippi River and of its principal tributaries." See below for corrections applied to daily gage height.

The records, as shown by the extracts given above, indicate the following: The original gage was of the inclined type from 0 to 19 feet and of the vertical type from 19 to 34 feet; this gage was maintained within 0.1 foot of its proper elevation (disregarding the results of the inspection of March 22, 1887, which seem unquestionably to be in error) until August 18, 1889, when it was replaced by a gage of the vertical type in four sections. This vertical gage appears to have remained intact until October 23, 1894, when the portion below 10 feet was removed and the low-water portion of gage rebuilt 50 feet downstream at its present location. On October 28, 1896, the gage was rebuilt in one section from −2.0 to 32.5 feet in the form of a 2 by 4 inch wooden scantling attached to crib work of draw "on downstream face of face facing Florence." During 1897–1900 the gage was corrected upon each visit because of the settling of the crib which was said to be due to the addition of rock ballast. On November 15, 1901, the gage was rebuilt in its present condition. The gage was finally hung on February 14, and the first regular reading made upon it on February 16, 1902. The section from −1.92 to 7.58 was immediately knocked off by a boat, but was not reset until August 23, 1902. This low-water section was again knocked off and replaced during 1910. This gage has remained at the correct elevation.

Gage observers: W. P. Stradford, November 7, 1871, to July, 1882; W. E. Manley, July to November, 1882; Robert Emmet Coburn, November, 1882, to September 30, 1913.

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Bench marks.—B. M. No. 1 [1] (Merrill, 1871). Southwest corner of top of fourth small pier north of bridge; elevation above gage datum, 30.19 feet; above sea-level datum, 431.04 feet. (Elevation above mean sea level given as 431.044 feet in Appendix 3 to Annual Report of United States Coast and Geodetic Survey, 1903).

P. B. M. No. 12.[1]—Top of copper bolt leaded vertically into northwest corner of east pedestal stone of the second pier north of the north abutment of the Florence bridge. Elevation above gage datum, 31.20 feet.

B. M. A. (Ewens, 1894).[2]—Cross, cut on top northeast corner of upstream end of first abutment pier from Florence side of Memphis & Charleston Railroad bridge, 1 foot from upstream face and 0.7 foot from northeast corner; elevation above zero of gage 34.67 feet. This bench mark has not been used for years; on November 19, 1914, it was not accessible, as the part of the pier mentioned was covered by a coal house.

B. M. No. 2.—Top of copper plug marked U. S. P. B. M., set in top, on upstream side, of stone foundation of second leg of steel railroad trestle from right abutment of wagon bridge; elevation above gage datum, 27.22 feet; above sea-level datum, 428.07 feet.

B. M. No. 3.—Cross mark, with letters U. S. B. M. around it, on top of downstream side of stone foundation of fourth bent of steel railroad trestle from right abutment of wagon bridge; elevation above gage datum, 31.08 feet; above sea-level datum, 431.93 feet.

Daily gage height.—The following tables contain gage heights as furnished by the Mississippi River Commission, with differences as noted. Where gage-height records are kept in such a way that all possible corrections are supposed to have been made by those charged with the maintenance of the gage, as is true of the Florence record, such records should be accepted as correct unless there is some tangible basis for additional corrections. Those maintaining a gage have first-hand information, and it is reasonable to assume that their values are the most probable ones, even though opinions may differ as to certain corrections. This point of view has been taken in preparing the records for the station at Florence. When the gage heights appeared erroneous but there were no data upon which to base a correction, the gage heights were published as read and adjustments made in the discharge computed therefrom as noted under "Daily discharge."

From November 7, 1871, to January 31, 1887, daily gage height in following tables is one reading per day at about 8 a. m., and from February 1, 1887, to September 30, 1913, the mean of two readings per day at about 8 a. m. and 4 p. m. From November 7, 1871, to October 23, 1894, the gage heights in the following tables are as published by the Mississippi River Commission, except that prior to January 1, 1890, they have been reduced to the nearest tenth of a foot, and that from January 9 to 22, 1881, the 8 a. m. readings are given, whereas for that period the Mississippi River Commission published the mean of 6 a. m., 12 m., and 6 p. m. readings. It appears that some of the gage heights prior to October 24, 1894, are subject to error, as pointed out under "Daily discharge" below. From October 24, 1894, to September 30, 1913, the gage heights are taken from the original records of the Mississippi River Commission at St. Louis with corrections, based upon the results of inspections, as follows:

June 1, 1895, to March 31, 1896, subtracted 0.1 foot; April 1 to October 27, 1896, subtracted 0.2 foot; April 10 to September 14, 1897, subtracted 0.1 foot; February 1 to July 31, 1898, subtracted 0.1 foot; August 1 to November 5, 1898, subtracted 0.2 foot; January 1 to January 20, 1900, subtracted 0.1 foot; January 21 to November 13, 1900, subtracted 0.2 foot; May 16 to November 15, 1901,

[1] Stages of the Mississippi River and of its principal tributaries for 1913.
[2] Stages of the Mississippi River and of its principal tributaries for 1903.

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subtracted 0.1 foot; November 16, 1901, to February 15, 1902, subtracted 0.2 foot; February 16 to May 6, 1902, subtracted 0.2 feet (below 7.58 feet); May 7 to August 23, 1902, subtracted 0.3 foot (below 7.58 feet); September 15 to November 5, 1904, added 0.4 foot.

The corrections subsequent to 1896 were made in the values published by the Mississippi River Commission, although some of the periods differ slightly from those noted above.

The gage heights between the inspections of May 18 and November 5, 1904, are open to question. The inspection record states: "November 5, 1904, gage found correct but could not be read below 2.0 feet because the paint was washed off. Temporary gage put in by observer 300 meters above permanent gage on railroad bridge has been read by him since June 19, 1904. Temporary gage set correctly but observer reported readings 0.4 foot too low." Records have been corrected as noted above, but it is not clear why September 15 was selected except that a sudden drop would otherwise appear in the record. Either the stated distance, 300 meters, is in error or the temporary gage was set to read same as the regular gage rather than at the same elevation. The inspection record further states that a new temporary section was set November 5 on right bank directly opposite the permanent gage.

Readings published by Mississippi River Commission October 2 to 7, 1908, should read —0.1 instead of 0.0 foot.

Control.—Rocky and probably permanent.

Discharge measurements.—Made by United States Geological Survey from downstream side of 17-span combined railway and highway bridge. Lower level is a through highway bridge and from this level the discharge measurements are now made. Several discharge measurements have been made about 2 miles downstream by the United States Engineer Corps.

A table of 22 discharge measurements for Tennessee River at Florence, Ala., has been published by the United States Engineer Corps on plate 182, House Document 360, Sixty-second Congress, second session, but this table is misleading in that only 7 of the tabulated discharge values are the results of field determinations of discharge at Florence and the dates of the other values, which are calculated from observations at other points on the river, are the dates when the calculations were made, not when the observations were taken. The table on page 157, furnished by Maj. H. Burgess, Corps of Engineers, Nashville, Tenn., takes the place of the one on plate 182 referred to above and explains the authority for the results.

The table of eight discharge measurements on page 157 gives the results of all field determinations of discharge known to have been made at or near Florence. The values for the first seven measurements are from the table furnished by Maj. Burgess.

An additional discharge measurement is referred to on pages 2014 and 2016 of the Annual Report of the Chief of Engineers, United States Army, for 1896, as follows: "On September 25, 1891, an observation was made about 1 mile below Florence Bridge. The only record of this observation to be found is contained in a letter dated April 12, 1892, written by Capt. G. W. Goethals, Corps of Engineers, United States Army, to the Chief of Engineers, United States Army. * * * Other observations have been made at Florence, but no record of same can be found except the letter of Capt. Goethals before referred to, which gives the discharge for a 1.4-foot stage, as 22,444 cubic feet at a section 5,875 feet below the Florence Bridge. This result is undoubtedly wrong."

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Daily discharge.—Published only for the years ending September 30, 1895–1913, computed from discharge rating table on pages 158–159. Discharge prior to October 1, 1894, is withheld from publication because of the uncertainty as to the corrections necessary to the published gage heights to render the rating table on pages 158–159 applicable to them. This uncertainty is due to the error of 0.83 foot found October 23, 1894, in the reading of the old gage as compared to the new gage, and to the lack of information as to the length of the period over which the error extends.

Field investigations made in August to November, 1914, under the direction of Maj. H. Burgess, Corps of Engineers, United States Army, show that the greater part of the error was due to the slope of the water surface between the locations of the old and new gages. A temporary gage was established in August, 1914, at the location of the old gage, with its zero at the same elevation as that of the new gage at Florence, and comparative readings on the two gages were taken. From a curve of relation of these gage readings there has been derived the following table of corrections which should be applied to readings made at the old location 50 feet upstream from the present gage:

Readings on temporary gage.	Correction (subtract).	Readings on temporary gage.	Correction (subtract).
Feet.	*Foot.*	*Feet.*	*Foot.*
0.0 to 0.1	1.0	1.2 to 1.4	0.5
.2 to .4	.9	1.5 to 1.7	.4
.5 to .6	.8	1.8 to 2.1	.3
.7 to .8	.7	2.2 to 2.9	.2
.9 to 1.1	.6	Above 2.9 feet.	.1

The above results were not available until after the computations for this report were completed, and the computations of daily discharge October 1 to 23, 1894, have not been revised because there is comparatively little difference between the corrections applied and those given above.

In computing daily discharge October 1 to 23, 1894, the following reductions were made in the published daily gage height before entering the discharge rating table: October 1–17, 21, and 22, 0.8 foot; October 18–20, 0.7 foot; and October 23, 0.4 foot.

Discharge July to November, 1898, appears low as compared to Chattanooga, but since there is no other reason to question the reduction in daily gage height noted on page 153, the discharge has been computed from the gage heights as published by the Mississippi River Commission. It should be noted that the distribution of precipitation during this period appears to warrant a high comparative ratio.

Discharge September to November, 1904, estimated by comparison with Chattanooga and Johnsonville because discharge computed from published gage heights seems too great as compared to these stations. See "Daily gage height" above.

Discharge August 26 to September 10, 1911, seems low compared to the discharge at Chattanooga, the ratio for the period being 1.01. There is nothing in addition to this upon which to base a correction at Florence, and hence none has been made. The data for the period should, however, be used with caution.

Duration of flow.—The table on page 194–195 gives the number of days in each year that the daily discharge as given in the tables on pages 181–190 was less than the limiting values of discharge given in the first column of the duration table. For a more complete explanation of the duration table see description of the Chattanooga station on page 95.

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Floods.—The highest flood on record at Florence occurred March 16–20, 1897, maximum stage 32.5 feet. The following table gives hourly stages during the crest period of this flood:

Date.	Time.	Gage height.	Date.	Time.	Gage height.	Date.	Time.	Gage height.
Mar. 16	8 a. m.	23.9	Mar. 17	6 p. m.	25.2	Mar. 19	6 p. m.	32.3
	9 a. m.	24.0	18	8 a. m.	25.8		9 p. m.	32.45
	10 a. m.	24.1		9 a. m.	26.0		10 p. m.	32.5
	11 a. m.	24.2		10 a. m.	26.1		12 p. m.	32.5
	12 m.	24.3		11 a. m.	26.2	20	5 a. m.	32.0
	3 p. m.	24.4		12 m.	26.3		7 a. m.	31.7
	4 p. m.	24.5		3 p. m.	26.7		8 a. m.	31.6
	8 p. m.	24.6	19	8 a. m.	31.1		9 a. m.	31.5
17	8 a. m.	25.00		9 a. m.	31.2		10 a. m.	31.4
	9 a. m.	25.05		10 a. m.	31.5		11 a. m.	31.2
	10 a. m.	25.07		11 a. m.	31.6		12 m.	31.1
	11 a. m.	25.08		12 m.	31.7		1 p. m.	30.0
	12 m.	25.10		2 p. m.	31.8		2 p. m.	29.9
	3 p. m.	25.2		3 p. m.	32.0		3 p. m.	29.8
	4 p. m.	25.2		5 p. m.	32.2		4 p. m.	29.7

It is stated that during this flood 75 feet of levee near the bridge and the Memphis & Charleston Railroad approach was washed out, that 300 feet of the railroad track was inundated, that the water was 2½ feet deep in the railroad station, and that four bridges over tributaries between Florence and Riverton were washed out.

The flood of 1867 reached a stage of 31.1 feet at Florence, according to the United States Weather Bureau, and it is stated that the Memphis & Charleston Railroad station then had about 2.7 feet of water on the floor, and that a place known as Mound Garden had about 4 feet on the floor.

Winter flow.—Discharge relation not materially affected by ice.

Regulation.—Until November, 1913, there was very little artificial regulation of the flow at Florence. Filling of the reservoir behind the Hale's Bar dam of the Chattanooga & Tennessee River Power Co., about 175 miles above Florence, was begun about October 10, 1913. Data in this report, therefore, are not affected by the operation of the power plant at this dam.

Ratios.—The ratios of monthly and yearly mean discharge of Tennessee River at Chattanooga, Florence, and Johnsonville are given in the table on pages 88–93. See discussion which accompanies table.

Accuracy.—The accuracy ratings given in the tables of monthly discharge, especially for the earlier years, must not be considered to indicate as closely the probable reliability of the data as the accuracy ratings outlined on page 15 for the average gaging station. A low accuracy rating in the following tables does not signify that the mean discharge is known to be in error by the amount indicated, but rather that it appears from studies of the data and comparisons with other stations that the mean discharge is doubtful to that extent. The accuracy ratings will assist those using the data in determining by brief inspection whether certain portions of the record are considered sufficiently accurate for the purpose in hand or whether they require special investigation to more closely determine their probable reliability.

In marking the accuracy ratings considerable weight was given to the ratios of discharge at Chattanooga, Florence, and Johnsonville, especially the Chattanooga-Florence comparison. Some of the more pronounced inconsistencies have been pointed out under "Daily gage height" and "Daily discharge." When the comparisons indicated that the records were in error, the data were investigated and corrections made as noted under "Daily gage height" and "Daily discharge."

The records presented in the following tables are believed to be as accurate and reliable as the obtainable base data will yield and they are believed to be free from gross errors.

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Cooperation.—The gage height record, as noted above, was furnished by the Mississippi River Commission. Discharge measurements prior to 1913 were made by the United States Engineer Corps.

Special acknowledgment is due to Maj. H. Burgess, Corps of Engineers, United States Army, Nashville, Tenn., and Mr. Kivas Tully, assistant engineer, Mississippi River Commission, St. Louis, Mo., for assistance rendered in interpreting questionable portions of the data.

Discharge measurements of Tennessee River at Florence, Ala., during 1888–1913.

No.[a]	Date.	Hydrographer.	Gage height.	Discharge.[b]
	1888.		*Feet.*	*Sec.-ft.*
21	Mar. 30.....	Lieut. H. E. Waterman [c].....	20.0	250,000
	1901.			
20	Aug. 21.....	W. S. Winn [c].....	18.6	[d] 252,000
15	Aug. 26.....	.....do.....	14.9	[d] 168,000
14	Aug. 29.....	.....do.....	9.5	[d] 92,800
13	Aug. 30.....	.....do.....	8.0	[d] 78,000
5	Sept. 27.....	.....do.....	3.6	[d] 36,000
	1908.			
4	Sept. 25–26..	F. I. Louckes [c].....	.2	12,000
	1913.			
	Aug. 21.....	Warren E. Hall [e].....	.55	13,500

[a] See discharge table on this page.
[b] Reduced to three significant figures.
[c] Corps of Engineers, U. S. Army.
[d] Section at Sheffield Landing.
[e] U. S. Geological Survey.

NOTE.—See "Discharge measurements" in station description.

Discharge table for Tennessee River at Florence, Ala., furnished by Maj. H. Burgess, Corps of Engineers, U. S. Army.[a]

No.	Date.	Gage height.	Discharge.	Authority.
		Feet.	*Sec.-ft.*	
1	Sept., 1891.....	−0.8	6,500	Calculated; see An. Rep., Chief of Engrs., 1896, pp. 2014, 2016, and 2020.
2	Oct., 1890.....	− .8	8,000	Calculated for Colbert Shoals section; same pages 1896 report given above.
3	Oct., 1894.....	− .2	10,000	Reduced from Brown's Riverton discharge.
4	Sept. 25–26, 1908...	+ .2	12,000	F. I. Louckes.
5	Sept. 27, 1901.....	3.6	36,000	W. S. Winn; section at Sheffield Landing.
6	1899.....	4.2	43,200	Reduced from Winn's Riverton discharge.
7	1899.....	5.0	51,000	Do.
8	1899.....	5.95	59,750	Do.
9	1899.....	6.35	60,300	Do.
10	1899.....	6.8	60,750	Do.
11	1899.....	7.1	64,000	Do.
12	1899.....	7.4	68,200	Do.
13	Aug. 30, 1901.....	8.0	78,000	W. S. Winn; section at Sheffield Landing.
14	Aug. 29, 1901.....	9.5	92,800	Do.
15	Aug. 26, 1901.....	14.9	167,500	Do.
16	1899.....	15.3	192,300	Reduced from Winn's Riverton discharge.
17	1899.....	15.7	191,750	Do.
18	1899.....	17.2	192,000	Do.
19	1899.....	17.3	216,000	Do.
20	Aug. 21, 1901.....	18.6	251,800	W. S. Winn; section at Sheffield Landing.
21	Mar., 1888.....	20.0	250,000	Lieut. H. E. Waterman; see An. Rep., Chief of Engineers, 1896, pp. 2014, 2015, 2016, and 2020.
22	1899.....	20.0	264,000	Reduced from Winn's Riverton discharge.

[a] See "Discharge measurements" in station description.

NOTES.—1. This is a corrected table, to take the place of that given for the Florence rating curve on plate 182, House Document No. 360, Sixty-second Congress, second session. The 22 discharges given in the table (except 1, 2, and 21) are those referred to on page 12, House Document No. 14, Committee on Rivers and Harbors, Sixtieth Congress, second session, in the following words:

"*Discharge.*—Careful discharge observations were made in the river just below Florence. The cross section adopted was subdivided, and in each division there were read with a current meter the top, bottom,

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and intermediate velocities. The average velocity was taken as the mean velocity of the section, and the discharge in each section computed. The sum of these gave the river discharge. From these observations it was determined that the flow of the river at a 0.2 stage on the gage at Florence was 12,063 cubic feet per second.

"In 1902 (should be 1901) a number of similar discharge observations were taken for the Engineer Department by Mr. W. S. Winn, assistant engineer, about 2 miles below this cross section, where the area corresponded fairly well with the one observed and where the discharge would not likely vary considerably from that of the section examined, since no important streams enter between. It is considered safe, therefore, to include these observations as indicating the discharge of the river for the corresponding gage readings (as they were referenced to the Florence gage), and they have accordingly been platted in the same curve. A number of discharge observations were also taken several years ago at Riverton (about 30 miles below Florence), for higher stages. Inasmuch as the streams entering the river in the intervening stretch are comparatively small, it is assumed that at high stages the error in taking these readings as applicable to the Florence cross section would be comparatively slight, and they are likewise platted in the same curve.

"There is, therefore, submitted a curve which is believed to show approximately and within the limits of reasonable error the discharge of the river at Florence, it being more especially useful for low readings of the gage. From this the discharge of the Tennessee River at Florence is seen to be about 10,650 cubic feet per second when the gage reads zero. Extreme low water is −0.8 on the Florence gage, from which it appears that the corresponding discharge would be 7,200 cubic feet per second."

2. Nos. 1 and 2 are calculated, in the manner described on pages 2014 and 2016, Annual Report Chief of Engineers, 1896, and are believed to be of no great value.

No. 4 is a field observation by F. I. Louckes on September 25–26, 1908.

Nos. 5, 13, 14, 15, and 20 are from field observations by W. S. Winn in August and September, 1901, worked up by F. I. Louckes in 1908, and were made at a section about 2½ miles below the Florence gage; no streams of importance entering between the gage and the discharge section. Description of method of taking these discharges has never been published.

No. 21 is a field observation made March, 1888, by Lieut. Waterman. Method used is described on pages 2014, 2015, and 2016, Annual Report Chief of Engineers for 1896.

No. 3 is a reduced Riverton discharge observation made by G. W. Brown in October, 1894, and described on page 2016, Annual Report Chief of Engineers, 1896. Nos. 6, 7, 8, 9, 10, 11, 12, 16, 17, 18, 19, and 22 are reduced Riverton measurements made by W. S. Winn and calculated by Nelles in 1899. Methods of making Riverton measurements are described on pages 2274–2280, Annual Report Chief of Engineers, 1899. Reductions for use at Florence were made in 1908 by F. I. Louckes (see above quotation).

3. The Florence rating curve given on plate 182 is essentially a replotting of that prepared by Louckes in 1908, and about corresponds to the table as given above.

Discharge rating table for Tennessee River at Florence, Ala., from Oct. 1, 1894, to Sept. 30, 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
−1.00	6,400	2.90	30,200	6.80	66,650	10.70	113,230
− .90	6,810	3.00	31,000	6.90	67,720	10.80	114,550
− .80	7,230	3.10	31,810	7.00	68,800	10.90	115,870
− .70	7,660	3.20	32,630	7.10	69,890	11.00	117,200
− .60	8,100	3.30	33,450	7.20	70,990	11.10	118,540
− .50	8,550	3.40	34,280	7.30	72,090	11.20	119,880
− .40	9,020	3.50	35,120	7.40	73,200	11.30	121,230
− .30	9,500	3.60	35,960	7.50	74,320	11.40	122,580
− .20	9,990	3.70	36,810	7.60	75,440	11.50	123,940
− .10	10,490	3.80	37,670	7.70	76,570	11.60	125,300
.00	11,000	3.90	38,530	7.80	77,710	11.70	126,670
.10	11,520	4.00	39,400	7.90	78,850	11.80	128,040
.20	12,050	4.10	40,280	8.00	80,000	11.90	129,420
.30	12,590	4.20	41,170	8.10	81,150	12.00	130,800
.40	13,140	4.30	42,060	8.20	82,310	12.10	132,190
.50	13,700	4.40	42,960	8.30	83,470	12.20	133,580
.60	14,280	4.50	43,870	8.40	84,640	12.30	134,980
.70	14,870	4.60	44,780	8.50	85,820	12.40	136,380
.80	15,470	4.70	45,700	8.60	87,000	12.50	137,790
.90	16,080	4.80	46,630	8.70	88,190	12.60	139,200
1.00	16,700	4.90	47,560	8.80	89,390	12.70	140,620
1.10	17,330	5.00	48,500	8.90	90,590	12.80	142,040
1.20	17,970	5.10	49,450	9.00	91,800	12.90	143,470
1.30	18,620	5.20	50,410	9.10	93,010	13.00	144,900
1.40	19,280	5.30	51,370	9.20	94,230	13.10	146,340
1.50	19,950	5.40	52,340	9.30	95,450	13.20	147,780
1.60	20,620	5.50	53,320	9.40	96,680	13.30	149,230
1.70	21,300	5.60	54,300	9.50	97,920	13.40	150,680
1.80	21,990	5.70	55,290	9.60	99,160	13.50	152,140
1.90	22,690	5.80	56,290	9.70	100,410	13.60	153,600
2.00	23,400	5.90	57,290	9.80	101,670	13.70	155,070
2.10	24,120	6.00	58,300	9.90	102,930	13.80	156,540
2.20	24,850	6.10	59,320	10.00	104,200	13.90	158,020
2.30	25,590	6.20	60,350	10.10	105,470	14.00	159,500
2.40	26,340	6.30	61,380	10.20	106,750	14.10	160,990
2.50	27,100	6.40	62,420	10.30	108,030	14.20	162,480
2.60	27,860	6.50	63,470	10.40	109,320	14.30	163,980
2.70	28,630	6.60	64,520	10.50	110,620	14.40	165,480
2.80	29,410	6.70	65,580	10.60	111,920	14.50	166,990

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Discharge rating table for Tennessee River at Florence, Ala., from Oct. 1, 1894, to Sept. 30, 1913—Continued.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
14.60	168,500	20.30	262,000	26.00	369,000	31.70	482,820
14.70	170,020	20.40	264,370	26.10	370,940	31.80	484,880
14.80	171,540	20.50	266,150	26.20	372,880	31.90	486,940
14.90	173,070	20.60	267,930	26.30	374,820	32.00	489,000
15.00	174,600	20.70	269,720	26.40	376,770	32.10	491,060
15.10	176,140	20.80	271,510	26.50	378,720	32.20	493,120
15.20	177,680	20.90	273,300	26.60	380,670	32.30	495,190
15.30	179,230	21.00	275,100	26.70	382,620	32.40	497,260
15.40	180,780	21.10	276,900	26.80	384,580	32.50	499,330
15.50	182,340	21.20	278,710	26.90	386,540	32.60	501,400
15.60	183,900	21.30	280,520	27.00	388,500	32.70	503,470
15.70	185,470	21.40	282,330	27.10	390,460	32.80	505,540
15.80	187,040	21.50	284,150	27.20	392,420	32.90	507,620
15.90	188,620	21.60	285,970	27.30	394,380	33.00	509,700
16.00	190,200	21.70	287,800	27.40	396,350	33.10	511,780
16.10	191,790	21.80	289,630	27.50	398,320	33.20	513,860
16.20	193,380	21.90	291,460	27.60	400,290	33.30	515,940
16.30	194,980	22.00	293,300	27.70	402,260	33.40	518,020
16.40	196,580	22.10	295,140	27.80	404,240	33.50	520,100
16.50	198,190	22.20	296,980	27.90	406,220	33.60	522,180
16.60	199,800	22.30	298,820	28.00	408,200	33.70	524,260
16.70	201,420	22.40	300,670	28.10	410,180	33.80	526,340
16.80	203,040	22.50	302,520	28.20	412,160	33.90	528,420
16.90	204,670	22.60	304,370	28.30	414,140	34.00	530,500
17.00	206,300	22.70	306,220	28.40	416,130	34.10	532,590
17.10	207,940	22.80	308,080	28.50	418,120	34.20	534,680
17.20	209,580	22.90	309,940	28.60	420,110	34.30	536,770
17.30	211,230	23.00	311,800	28.70	422,100	34.40	538,860
17.40	212,880	23.10	313,670	28.80	424,100	34.50	540,950
17.50	214,540	23.20	315,540	28.90	426,100	34.60	543,040
17.60	216,200	23.30	317,410	29.00	428,100	34.70	545,130
17.70	217,870	23.40	319,290	29.10	430,100	34.80	547,220
17.80	219,540	23.50	321,170	29.20	432,100	34.90	549,310
17.90	221,220	23.60	323,050	29.30	434,100	35.00	551,400
18.00	222,900	23.70	324,930	29.40	436,110	35.10	553,500
18.10	224,580	23.80	326,820	29.50	438,120	35.20	555,600
18.20	226,270	23.90	328,710	29.60	440,130	35.30	557,700
18.30	227,960	24.00	330,600	29.70	442,140	35.40	559,800
18.40	229,650	24.10	332,500	29.80	444,160	35.50	561,900
18.50	231,350	24.20	334,400	29.90	446,180	35.60	564,000
18.60	233,050	24.30	336,300	30.00	448,200	35.70	566,100
18.70	234,760	24.40	338,210	30.10	450,220	35.80	568,200
18.80	236,470	24.50	340,120	30.20	452,240	35.90	570,300
18.90	238,180	24.60	342,030	30.30	454,260	36.00	572,400
19.00	239,900	24.70	343,940	30.40	456,290	36.10	574,510
19.10	241,620	24.80	345,860	30.50	458,320	36.20	576,620
19.20	243,350	24.90	347,780	30.60	460,350	36.30	578,730
19.30	245,080	25.00	349,700	30.70	462,380	36.40	580,840
19.40	246,810	25.10	351,620	30.80	464,420	36.50	582,950
19.50	248,550	25.20	353,540	30.90	466,460	36.60	585,060
19.60	250,290	25.30	355,470	31.00	468,500	36.70	587,170
19.70	252,040	25.40	357,400	31.10	470,540	36.80	589,280
19.80	253,790	25.50	359,330	31.20	472,580	36.90	591,390
19.90	255,540	25.60	361,260	31.30	474,620	37.00	593,500
20.00	257,300	25.70	363,190	31.40	476,670	38.00	614,700
20.10	259,060	25.80	365,120	31.50	478,720	39.00	636,000
20.20	260,830	25.90	367,060	31.60	480,770	40.00	657,400

NOTE.—The above table is not applicable for periods during which ice was present or channel was obstructed. It is based on eight discharge measurements listed in the table on page 157 and upon the other discharge figures listed in the lower table on page 157. The rating table is well defined between discharges 11,000 and 275,000 second-feet (gage heights 0.0 and 21.0 feet.) Use this table to three significant figures only.

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Daily gage height, in feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1872–1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1872.												
1	.....	.....	1.2	1.9	1.9	3.3	4.6	3.8	2.4	4.0	1.0	0.3
2	.....	.....	1.2	2.6	2.0	3.2	4.3	3.5	2.2	3.4	1.0	.3
3	.....	.....	1.3	3.3	1.8	3.2	4.0	3.3	1.9	2.8	.9	.3
4	.....	.....	1.3	4.5	1.5	3.4	3.7	3.0	1.5	2.2	.7	.3
5	.....	.....	1.2	5.8	1.3	3.7	3.7	2.9	1.2	1.8	.5	.4
6	.....	.....	1.3	6.2	1.7	4.0	4.1	2.7	1.0	1.5	.4	.4
7	.....	2.5	1.2	6.1	1.9	4.2	5.2	2.6	.8	1.3	.3	.2
8	.....	2.2	1.1	5.9	2.9	4.5	6.2	2.5	.8	1.2	.2	.1
9	.....	2.0	1.0	5.5	3.2	4.8	9.7	2.4	.7	1.3	.2	.0
10	.....	1.7	.9	5.0	3.5	5.5	11.3	2.2	2.8	1.2	.2	— .1
11	.....	1.4	.8	4.5	4.0	5.6	10.9	2.0	4.0	1.0	.2	— .3
12	.....	1.2	.6	4.1	4.4	6.5	10.3	1.8	3.4	.9	.4	— .3
13	.....	1.0	.6	3.6	4.6	8.4	11.0	1.7	2.8	1.0	.2	— .5
14	.....	.9	.6	3.2	4.6	9.4	11.5	1.5	3.3	7.7	.2	— .5
15	.....	.7	.6	3.0	4.7	9.9	10.9	1.4	4.3	10.8	.3	— .5
16	.....	.7	.6	2.7	4.6	9.5	10.4	1.3	4.0	9.6	.3	— .4
17	.....	.9	.5	2.4	4.5	8.4	9.7	1.3	3.6	7.5	.4	— .4
18	.....	1.3	.5	2.2	5.0	7.2	9.2	1.2	3.0	5.9	.4	— .2
19	.....	1.8	.3	2.2	5.5	6.6	8.6	1.2	2.5	5.8	.4	— .1
20	.....	1.8	.2	1.8	6.1	6.2	8.0	1.1	2.0	6.5	1.4	.0
21	.....	1.8	.2	1.8	6.4	6.1	7.2	1.1	1.6	5.9	2.7	— .1
22	.....	1.8	.2	1.8	5.8	5.9	6.8	1.1	1.4	5.2	2.7	— .2
23	.....	1.5	.4	1.8	5.3	5.4	6.8	1.1	1.3	4.5	2.6	— .3
24	.....	1.4	.2	1.8	4.8	5.2	7.6	1.3	1.1	3.7	2.5	— .4
25	.....	1.1	.3	1.9	4.3	5.2	7.8	3.2	1.0	3.1	2.0	— .2
26	.....	1.0	.4	1.8	4.0	5.4	7.0	3.8	.8	2.6	1.5	— .4
27	.....	1.0	.5	1.8	3.8	5.8	6.0	3.3	.6	2.3	1.1	— .5
28	.....	.9	.7	1.6	3.5	5.9	5.2	2.9	1.0	2.0	.8	— .2
29	.....	.9	1.3	1.3	3.3	5.6	4.6	2.8	3.1	1.7	.6	— .2
30	.....	1.1	1.6	1.7	.....	5.3	4.2	2.6	4.0	1.4	.4	.0
31	.....	.....	1.8	1.7	.....	4.9	.....	2.5	.....	1.2	.3	.....
1873.												
1	0.0	— .4	.5	6.1	7.0	18.6	12.5	3.6	3.7	3.7	1.0	1.0
2	— .2	— .3	.6	5.6	6.3	16.8	12.4	8.0	3.6	3.6	1.3	.9
3	— .1	— .3	.8	5.4	5.8	15.5	11.9	7.6	3.6	4.3	1.3	.7
4	.1	— .3	.8	6.2	5.4	13.9	10.2	7.0	3.7	6.1	1.2	.6
5	.2	— .4	.6	6.6	5.0	12.1	10.7	7.5	3.6	6.4	1.2	.7
6	.1	— .4	.6	7.9	5.1	10.4	9.8	7.2	3.4	5.7	1.3	.8
7	.0	— .4	.5	8.8	7.5	9.1	8.8	6.6	3.2	4.8	1.2	.6
8	— .2	— .4	.5	9.2	9.4	8.2	7.8	6.4	2.9	4.0	1.0	.5
9	— .1	— .3	.4	9.1	11.9	7.5	7.1	6.4	3.2	3.6	.8	.5
10	— .2	— .3	.3	8.4	13.4	7.0	6.6	6.9	3.6	3.8	.7	.6
11	— .4	— .2	.3	7.6	14.2	6.6	6.2	8.0	3.7	3.7	.6	.5
12	— .5	.3	.3	6.8	17.0	6.4	5.8	9.4	3.8	3.3	.6	.4
13	— .5	.8	.3	6.1	19.2	6.4	5.6	10.4	4.4	2.7	.5	.3
14	— .5	1.2	.2	5.4	19.3	6.3	5.4	10.5	4.4	2.3	.6	.2
15	— .4	1.5	.1	5.0	18.6	6.4	5.2	9.6	4.6	1.9	.5	.2
16	— .4	1.4	.2	4.7	19.8	6.5	5.0	8.0	5.8	1.6	.5	.1
17	— .4	1.0	.0	4.5	20.6	6.5	4.7	6.7	5.7	1.6	.5	.0
18	— .5	.6	.5	4.6	20.6	6.3	4.5	5.8	6.4	1.6	.6	— .1
19	— .6	.4	1.2	4.6	21.0	6.0	4.3	5.2	6.2	1.4	.7	.2
20	— .6	.3	4.0	4.7	22.2	6.8	4.2	4.7	5.4	1.2	1.0	— .1
21	— .7	.3	11.9	5.4	22.6	7.8	4.1	4.3	4.8	1.2	1.0	— .1
22	— .7	.2	15.2	6.2	22.9	8.5	4.0	3.9	4.4	1.1	1.0	— .2
23	— .7	.1	15.8	6.8	22.7	8.9	4.0	3.6	3.8	1.2	.7	.0
24	— .8	.0	16.2	7.4	22.2	9.0	3.8	3.4	3.4	1.5	.8	— .2
25	— .7	.0	16.4	9.1	21.7	8.7	3.6	3.5	3.6	1.6	1.0	— .2
26	— .8	.3	15.9	10.2	21.0	9.6	3.4	4.0	4.0	1.5	1.2	— .2
27	— .8	.1	13.8	10.4	20.8	9.8	3.2	4.7	3.6	1.4	1.3	— .2
28	— .8	.5	10.6	10.2	20.0	9.2	3.2	5.1	3.5	1.0	1.3	— .2
29	— .8	.4	8.2	9.5	.....	10.0	3.0	5.0	3.8	.8	1.2	— .2
30	— .7	.4	7.3	8.7	.....	11.4	2.9	4.5	3.8	.8	1.1	— .1
31	— .6	.....	6.6	7.8	.....	12.1	.....	4.1	.....	.8	1.0	.....

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Daily gage height, in feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1872–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1874.												
1	—0.0	1.7	5.2	3.4	9.0	9.5	9.4	20.0	2.9	0.9	3.6	7.5
2	— .0	2.2	4.6	3.2	9.0	11.8	9.2	20.0	2.7	1.0	5.0	10.4
3	— .1	1.9	3.8	3.0	8.4	12.2	8.5	20.0	2.6	1.4	5.4	10.4
4	.1	1.6	3.6	2.9	7.7	12.2	7.7	20.2	2.5	1.5	5.1	8.3
5	.4	1.4	4.2	3.0	7.0	12.2	7.0	19.8	2.4	1.5	4.2	6.0
6	.5	1.2	3.7	3.8	6.5	12.2	6.4	19.2	2.6	1.4	3.2	4.5
7	.3	.9	4.7	5.6	6.2	13.5	6.4	17.9	2.8	1.2	2.5	3.6
8	.1	.7	6.9	7.6	6.1	12.6	8.6	16.7	2.7	1.2	2.0	2.9
9	— .1	.6	6.8	9.0	5.9	11.5	14.7	15.6	2.7	1.0	1.5	2.3
10	— .2	.5	6.2	10.8	5.7	10.6	16.0	14.5	2.6	.8	1.2	1.8
11	— .3	.4	6.2	11.2	5.4	10.1	17.6	13.0	2.7	.7	1.2	1.4
12	— .4	.3	6.2	10.5	5.0	9.4	17.2	11.0	2.9	.6	1.7	1.2
13	— .4	.3	6.1	9.5	4.8	8.5	16.7	9.2	2.5	.9	2.1	1.0
14	— .4	.3	6.0	8.6	5.6	7.6	17.6	8.0	2.4	1.2	1.7	.8
15	— .3	.2	5.6	8.2	6.8	6.8	22.1	7.1	2.5	1.0	1.2	.6
16	— .3	.3	5.0	7.6	7.0	6.8	25.7	6.5	3.0	.8	.9	.5
17	— .3	.2	4.8	7.0	7.6	7.3	26.0	6.0	3.4	1.0	.8	.6
18	— .4	.9	4.6	6.6	9.1	7.4	25.2	5.6	3.7	1.2	.6	.6
19	— .2	.8	4.5	6.0	10.2	8.0	23.9	5.3	3.4	1.3	.4	.4
20	— .4	.9	4.2	5.5	10.2	9.8	23.3	5.0	2.9	1.5	.2	.3
21	— .4	2.4	3.9	4.9	9.8	12.8	22.9	4.7	2.6	1.4	.1	.4
22	— .4	4.9	3.6	4.5	9.2	15.5	22.4	4.4	2.3	1.2	.1	.6
23	— .4	4.9	3.7	4.3	9.6	17.9	23.6	4.2	2.0	1.1	.1	.9
24	— .2	5.9	4.6	5.2	8.8	18.4	24.2	3.9	1.7	.9	.0	1.1
25	— .2	6.8	4.6	5.8	7.6	17.9	23.5	3.7	1.5	.8	.0	1.2
26	.0	5.4	4.6	6.4	7.1	17.6	22.8	3.5	1.3	.8	.2	1.2
27	1.4	4.4	4.8	7.2	7.0	17.2	21.9	3.4	1.2	.7	.2	1.4
28	2.6	5.2	4.8	7.7	7.7	16.0	20.9	3.2	1.1	.8	.5	1.8
29	1.6	5.8	4.5	8.0	.....	13.8	20.2	3.2	1.0	1.2	1.2	2.2
30	1.0	5.5	4.1	8.0	.....	11.6	20.0	3.1	.9	1.7	2.6	2.0
31	.9	.....	3.8	8.4	.....	9.7	.....	3.0	.....	2.4	4.0	.....
1875.												
1	1.6	.2	4.9	3.9	17.0	24.4	16.7	10.0	2.6	2.8	4.8	2.3
2	1.4	.2	4.9	4.3	17.1	26.4	15.4	11.8	2.4	2.9	3.9	2.0
3	1.6	.1	5.9	5.6	17.8	27.6	15.4	12.8	2.2	2.8	3.4	1.7
4	2.1	.1	6.0	6.8	18.9	28.1	15.2	12.8	2.0	3.1	3.0	1.4
5	2.6	.1	5.6	8.8	18.2	28.7	15.1	11.5	2.0	3.1	3.0	1.3
6	2.9	.1	5.0	9.9	16.4	29.0	15.1	10.0	2.1	3.0	3.6	1.2
7	2.7	.1	4.3	10.1	13.4	29.3	14.8	8.3	2.3	2.8	3.7	1.1
8	2.0	.0	3.8	9.8	10.2	29.4	14.1	7.4	2.7	2.8	4.2	1.0
9	1.5	.0	3.3	8.8	8.2	28.8	12.9	6.6	3.1	3.0	4.0	.9
10	1.1	.0	3.0	7.7	7.0	28.0	11.4	6.2	3.0	3.0	3.4	.8
11	.8	.1	2.7	6.6	6.4	26.8	11.2	6.0	3.0	3.4	3.0	.8
12	.6	.2	2.6	6.1	6.4	25.5	11.6	5.6	3.0	3.5	2.8	.8
13	.6	.7	2.5	5.5	6.3	24.0	11.0	5.3	3.0	3.7	2.4	.8
14	.6	.8	2.4	5.2	6.2	22.2	10.9	5.0	2.8	4.2	2.2	.6
15	.5	1.5	2.3	4.9	7.7	20.2	10.8	4.8	2.5	6.2	2.2	.7
16	.4	2.2	2.3	4.7	8.5	18.9	10.1	4.5	2.2	6.5	3.2	.7
17	.4	2.3	2.2	4.4	8.7	16.8	9.2	4.2	1.9	7.8	4.7	1.2
18	.3	2.1	2.1	4.2	8.5	16.0	8.3	4.0	1.6	10.1	5.4	1.8
19	.2	1.8	2.0	4.0	7.8	15.8	7.5	3.7	1.5	11.0	6.8	6.4
20	.2	1.5	2.3	3.8	7.0	16.9	6.9	3.5	1.5	10.2	7.6	7.9
21	.1	1.2	3.4	3.5	6.7	20.9	6.6	3.4	1.7	8.2	7.6	7.5
22	.3	1.2	4.3	3.3	6.6	22.2	6.9	3.3	2.1	6.4	7.0	8.5
23	.8	1.3	5.9	3.1	6.7	22.1	6.8	3.2	2.3	5.6	6.1	8.0
24	1.3	2.6	6.5	3.4	11.6	21.8	6.3	3.1	2.2	5.0	5.1	6.4
25	1.4	3.0	6.4	5.0	20.0	21.1	6.2	3.0	2.3	4.8	4.2	4.9
26	1.2	4.9	6.0	6.2	22.9	21.0	6.4	3.0	2.7	5.8	3.5	3.9
27	1.0	6.8	5.4	7.6	24.0	21.6	7.5	2.9	3.0	7.3	3.0	3.3
28	.8	7.0	4.9	8.0	24.3	22.3	8.0	3.0	3.0	7.9	2.8	2.8
29	.6	6.6	4.4	11.9	.....	22.6	7.6	2.9	2.9	7.4	2.7	2.5
30	.5	5.8	4.0	14.6	.....	21.1	7.6	2.7	3.7	6.8	2.7	2.2
31	.3	.....	3.8	17.0	.....	18.6	.....	2.7	.....	5.8	2.5	.....

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Daily gage height, in feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1872–1915—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1876.												
1	2.0	0.4	5.3	18.9	9.9	5.7	11.8	4.6	7.4	5.0	1.8	0.8
2	1.8	.4	5.1	19.2	11.1	5.3	14.8	7.5	6.9	4.8	1.6	.8
3	1.7	.4	4.8	19.7	11.9	5.1	15.1	12.2	6.2	4.4	1.7	.7
4	1.6	.8	4.6	19.8	11.9	4.8	14.6	13.1	5.8	4.9	2.2	.6
5	1.5	1.0	4.6	19.0	11.9	4.6	13.5	13.0	5.5	4.0	3.6	.6
6	1.4	1.4	5.4	16.8	11.3	4.3	12.0	12.8	5.2	4.6	3.2	.7
7	1.3	1.8	7.0	13.4	10.6	4.3	10.4	11.6	5.4	5.2	3.1	.8
8	1.3	2.0	8.4	10.2	9.5	4.1	8.9	11.3	5.5	5.2	3.1	.7
9	1.4	2.7	8.9	8.2	8.7	4.2	7.8	11.7	5.5	5.0	3.4	.5
10	2.2	3.3	8.5	7.0	8.2	4.1	7.1	12.5	5.2	4.8	3.7	.4
11	3.0	4.1	8.0	6.4	8.1	4.3	6.5	13.0	4.7	4.6	3.3	.2
12	2.8	4.6	7.5	5.9	8.0	5.4	6.0	13.6	4.1	4.1	3.0	.2
13	2.4	4.7	7.0	5.4	8.0	6.0	5.6	13.7	3.6	4.0	2.7	.2
14	1.9	4.9	6.6	5.2	8.9	5.8	5.7	13.2	3.7	3.6	2.9	.2
15	1.7	5.7	6.0	4.9	10.4	5.5	6.1	12.1	3.7	3.2	2.8	.3
16	1.4	6.0	5.5	4.5	10.7	5.8	6.6	10.2	3.5	2.9	2.5	.4
17	1.2	5.8	5.0	4.4	11.5	11.7	7.6	8.6	3.5	3.0	2.1	.4
18	1.1	5.4	4.5	4.4	12.4	14.1	9.0	7.6	3.2	2.7	1.8	.4
19	1.0	5.2	4.0	7.2	13.1	14.8	8.9	6.3	4.5	2.6	1.8	.3
20	.9	5.1	3.7	7.4	13.1	15.2	8.2	6.1	9.5	2.7	1.8	.3
21	.9	4.7	3.4	7.5	12.2	14.7	7.5	5.6	11.4	2.6	1.7	.3
22	.8	4.2	3.2	9.2	10.4	13.7	6.9	5.3	12.4	2.6	1.6	.2
23	.8	4.1	3.0	10.0	8.8	12.0	6.4	5.4	12.4	2.9	1.5	.2
24	.7	4.3	2.9	10.2	7.8	10.8	5.9	5.2	10.4	2.8	1.4	.2
25	.7	5.3	4.5	9.8	7.4	11.3	5.4	5.0	7.8	2.8	1.2	.4
26	.7	5.3	7.0	9.0	7.0	11.9	5.0	4.9	6.4	2.8	1.1	.5
27	.6	5.4	7.2	9.0	6.8	12.1	4.7	5.0	5.6	2.6	1.0	.4
28	.5	5.7	9.8	9.9	6.4	12.8	4.6	5.1	5.0	2.3	.9	.4
29	.5	5.6	14.2	10.3	6.0	13.0	4.3	5.3	5.3	2.8	.9	.6
30	.6	5.4	17.8	10.6	.....	12.6	4.2	5.6	5.2	2.8	.9	.9
31	.4	.....	19.0	9.9	.....	12.0	.....	6.6	.....	2.0	.8	.....
1877.												
1	1.0	.4	1.0	.9	5.6	1.5	10.2	13.2	1.6	1.5	1.8	.4
2	.8	.3	.8	1.0	5.0	1.6	10.3	12.0	1.6	1.5	1.5	.2
3	.6	.0	.6	.7	4.5	1.8	10.6	10.4	1.5	1.8	1.2	.1
4	.4	.0	.5	.7	4.3	2.1	9.2	8.8	1.4	1.9	1.0	.0
5	.3	— .1	.5	.4	5.0	2.4	8.9	7.8	1.3	1.7	.7	.2
6	.2	— .2	.6	.6	6.1	3.0	8.8	7.1	1.2	1.4	.6	.6
7	.0	— .2	.6	.4	5.6	3.6	8.3	6.4	1.1	1.2	.6	1.3
8	.0	— .3	.4	.4	5.2	3.6	13.9	6.0	1.2	1.0	.7	1.0
9	.0	— .2	.2	.2	4.7	3.5	17.8	5.9	2.0	.9	.5	.7
10	— .1	— .2	.2	.7	4.2	4.4	19.4	5.8	3.2	.7	.6	.7
11	— .1	— .2	.1	2.4	3.8	5.7	19.2	5.7	2.8	.6	.4	1.0
12	— .2	— .2	.1	3.2	3.5	7.8	17.9	5.7	2.4	.7	.2	1.0
13	— .2	— .2	.1	3.6	3.2	9.6	17.7	5.9	2.0	.8	.1	.8
14	— .2	— .3	.0	3.9	3.0	10.1	17.9	6.0	1.9	.6	.1	.7
15	— .4	— .3	— .1	4.2	2.8	9.8	17.8	5.8	2.3	.5	.1	1.0
16	— .5	— .3	— .2	6.1	2.7	8.9	17.1	5.2	3.8	.6	.1	1.2
17	— .5	— .2	— .2	8.8	2.5	8.5	15.9	4.8	5.0	1.1	.0	1.0
18	— .5	— .3	.0	10.7	2.3	8.3	14.5	4.3	3.9	1.1	.0	.7
19	— .5	— .3	.0	12.4	2.2	8.0	13.6	4.0	3.6	3.9	.1	.4
20	— .5	— .4	.2	13.4	2.0	7.4	12.1	3.7	3.0	3.2	.3	3.2
21	— .6	— .2	.4	15.0	1.9	6.9	10.4	3.5	2.6	2.1	.3	4.2
22	— .3	— .3	.3	15.4	1.8	6.6	9.7	3.3	2.5	1.5	.4	3.4
23	— .2	— .2	.2	15.6	1.8	6.4	9.8	3.1	2.4	1.5	.6	2.2
24	— .2	— .1	.3	15.7	1.6	6.0	10.2	2.9	2.4	2.2	.4	1.8
25	— .2	.0	.3	15.8	1.6	5.8	10.4	2.7	2.6	3.0	.5	1.7
26	— .2	.2	.2	15.8	1.5	5.8	10.0	2.6	3.0	3.1	.3	1.5
27	— .1	.4	.3	15.2	1.5	6.0	11.0	2.4	2.9	3.2	.1	1.3
28	.6	.8	.5	13.4	1.5	6.2	14.7	2.3	2.4	3.3	.0	1.1
29	.9	1.3	.8	10.4	.....	7.1	15.5	2.1	2.0	3.0	.1	1.3
30	.7	1.2	.6	7.9	.....	8.7	14.5	1.9	1.7	2.7	.4	2.0
31	.4	.....	.9	6.4	.....	10.0	.....	1.8	.....	2.3	.5	.....

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Daily gage height, in feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1872–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1878												
1	2.0	1.4	8.2	9.3	7.0	10.2	4.6	7.0	2.2	0.8	−0.2	0.5
2	1.5	2.4	6.8	8.8	8.9	8.5	4.2	6.3	2.3	.7	− .3	.9
3	1.1	5.4	5.6	8.2	9.8	7.2	3.9	5.6	2.3	1.2	.0	1.4
4	.6	5.3	4.9	8.1	9.7	6.6	3.7	5.1	2.2	1.5	.6	1.5
5	.4	6.6	4.3	8.0	8.8	6.2	3.5	4.8	2.1	1.1	1.1	1.4
6	.2	6.7	3.9	7.3	7.6	5.8	3.4	4.6	1.7	1.2	1.1	1.3
7	.1	6.4	3.9	6.4	6.8	5.8	3.3	4.5	1.5	1.2	1.0	1.1
8	.2	5.4	4.4	5.8	6.1	5.9	3.3	4.4	1.3	1.0	.8	1.0
9	.4	4.8	4.9	5.1	5.8	5.8	3.5	4.5	1.4	.9	.6	.6
10	1.3	4.4	5.2	4.6	6.4	5.5	3.8	4.8	1.4	1.0	.3	.3
11	2.1	4.0	4.9	4.5	7.0	5.4	3.8	5.0	1.4	.8	.1	.0
12	2.0	3.5	4.5	4.7	8.2	5.7	3.8	4.8	1.2	.5	.0	− .2
13	1.7	3.3	4.0	5.3	9.1	7.3	4.4	4.4	1.3	.6	.0	− .3
14	1.5	3.4	3.6	6.7	9.1	7.8	5.2	4.1	1.4	.6	− .1	− .4
15	1.2	3.8	3.3	8.3	8.5	7.4	5.6	3.7	1.4	.6	− .2	− .5
16	1.1	4.0	3.0	9.1	7.6	7.4	5.6	3.4	1.6	.5	− .2	− .6
17	.9	4.0	2.8	8.8	7.0	7.7	5.2	3.2	1.8	.4	− .2	− .7
18	.7	3.3	2.6	8.0	6.5	7.8	4.7	3.0	2.2	.3	.0	− .8
19	.6	2.9	2.4	7.1	6.1	7.3	4.3	3.0	2.4	.3	.4	5.0
20	.5	2.7	2.2	6.6	5.8	6.5	6.4	2.8	1.9	.4	1.1	4.1
21	.8	3.0	2.0	6.3	6.2	5.7	7.8	2.8	1.7	.3	1.3	2.9
22	1.3	4.0	2.0	5.9	9.0	5.1	7.3	3.1	1.4	.2	1.0	1.9
23	1.4	4.3	1.8	5.4	9.7	4.6	6.7	3.8	1.2	.1	.8	1.4
24	1.3	5.0	2.3	5.0	9.9	4.3	10.2	4.5	1.0	.0	.5	1.0
25	1.3	5.7	5.6	4.8	10.3	4.0	12.2	4.1	1.0	.0	.2	1.2
26	1.5	6.2	5.2	4.9	11.6	3.7	13.6	3.9	.9	− .1	.2	.8
27	1.6	6.9	5.1	5.0	12.2	3.4	12.8	3.1	1.0	− .2	1.2	.4
28	1.7	8.8	5.9	5.0	11.8	3.7	11.1	2.8	1.0	− .2	1.2	.2
29	1.5	9.6	6.7	5.4	.....	5.0	9.2	2.4	1.0	− .1	1.0	.2
30	1.4	9.2	8.0	5.4	.....	5.5	7.8	2.2	.8	− .2	.6	.1
31	1.4	.....	9.4	5.4	.....	5.0	.....	2.2	.....	− .2	.5	.....
1879.												
1	.0	2.0	11.4	4.1	9.4	9.9	5.5	3.4	1.5	.2	.3	2.3
2	− .1	1.5	11.4	4.0	9.6	9.2	5.3	3.2	1.5	.2	.5	2.2
3	− .1	1.2	11.3	4.6	9.7	8.6	5.5	3.0	1.5	.2	.5	3.6
4	− .2	1.0	10.7	4.9	9.8	8.3	6.0	2.9	1.8	.1	1.2	2.2
5	− .4	1.1	10.0	5.3	10.0	7.6	6.3	2.9	1.6	.2	1.9	2.0
6	− .5	1.1	8.9	5.2	11.2	6.9	6.4	2.7	1.5	.2	2.1	1.9
7	− .4	1.1	8.0	5.1	10.5	6.2	6.1	2.6	1.4	.2	2.4	1.5
8	− .4	1.0	7.2	4.2	10.2	5.6	5.5	2.5	1.3	.2	2.6	1.2
9	− .5	.8	7.0	5.8	10.0	5.2	5.1	2.4	1.2	.1	2.5	1.0
10	− .4	.7	8.9	8.8	9.6	4.8	5.3	3.4	1.1	.1	2.0	1.0
11	− .3	.5	9.1	10.8	9.4	4.6	7.4	3.7	1.0	.1	1.6	1.0
12	− .3	.3	8.8	14.4	9.4	4.3	8.0	3.4	.9	.0	1.3	.8
13	− .3	.2	8.6	19.3	8.7	4.2	8.1	2.9	.8	.0	1.2	.8
14	− .2	.2	8.7	20.0	7.8	4.0	7.9	3.0	.8	.0	1.2	.6
15	− .1	.0	8.2	19.5	7.2	3.8	7.5	3.1	.8	.0	1.1	.4
16	− .1	.0	8.2	19.4	6.8	3.8	7.2	3.0	1.0	.0	1.0	.2
17	.1	− .1	8.3	19.8	6.7	4.0	7.4	4.0	1.1	.0	.8	.2
18	− .1	− .1	8.4	20.4	10.1	4.6	7.5	3.6	1.1	.0	.7	.1
19	.0	.0	8.4	21.4	12.1	4.8	7.4	3.4	1.1	.3	.4	.0
20	.0	.0	8.0	21.4	13.1	4.5	7.2	3.4	1.0	.2	.4	.0
21	.0	.1	7.5	20.4	13.7	5.2	6.8	3.6	1.0	.2	.6	.0
22	.0	.0	6.8	17.8	13.6	6.9	6.4	3.8	.8	.2	1.6	− .1
23	− .1	.2	6.4	15.0	12.8	9.2	6.0	3.8	.8	.1	2.2	− .1
24	− .2	.3	6.0	12.4	12.2	9.6	5.7	3.6	.6	.0	2.0	− .2
25	− .1	.4	6.0	10.2	11.2	9.0	5.4	3.4	.6	.1	1.7	− .3
26	− .1	.7	6.2	8.5	10.4	8.2	5.0	3.0	.6	.3	1.3	− .3
27	.0	.9	6.3	7.4	10.4	8.0	4.6	2.7	.4	.4	1.0	− .3
28	.1	2.8	6.0	6.6	10.3	7.4	4.2	2.5	.4	.4	.8	− .4
29	2.6	7.2	5.4	6.8	.....	6.8	4.0	2.2	.3	.2	1.1	− .4
30	3.3	10.4	4.7	8.4	.....	6.2	3.8	1.9	.2	.4	1.6	− .4
31	2.7	.....	4.2	9.1	.....	5.9	.....	1.7	.....	.3	1.8	.....

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Daily gage height, in feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1872–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1880.												
1	−0.5	1.3	2.3	10.6	3.4	7.4	6.4	11.7	4.3	1.1	0.8	1.0
2	− .5	1.1	2.5	8.3	3.4	7.7	6.2	11.2	4.2	.9	.6	1.1
3	− .5	1.0	3.5	6.8	4.7	7.5	11.0	10.9	4.8	.9	.5	1.7
4	− .5	.8	3.6	6.0	6.7	8.8	14.5	10.4	4.8	1.2	.4	1.4
5	− .5	.7	3.6	5.3	6.6	11.0	15.3	9.8	4.5	1.9	.3	1.2
6	− .5	.6	6.2	5.0	6.3	12.0	14.5	9.0	4.3	1.9	.2	1.0
7	− .4	.5	8.6	9.2	6.1	12.6	14.0	8.0	3.8	3.6	.2	1.1
8	.0	.4	7.8	11.0	5.8	15.0	13.2	7.0	3.5	4.4	.4	1.2
9	.3	.4	6.6	14.2	5.2	15.7	11.8	6.3	3.3	3.9	1.0	1.4
10	− .1	.3	5.9	14.3	4.8	15.2	10.2	5.6	2.9	3.5	1.6	1.3
11	− .3	.3	7.6	13.2	4.4	15.1	9.0	5.0	2.6	3.1	2.0	1.2
12	− .3	.2	11.2	12.2	4.1	15.8	7.9	4.6	2.4	2.6	2.0	1.1
13	− .4	.2	13.0	10.8	4.8	18.0	7.1	4.4	2.2	2.2	1.7	1.0
14	− .2	.2	13.6	9.6	6.3	19.2	6.4	4.1	2.0	1.9	1.5	1.0
15	.0	.5	14.4	8.5	5.7	20.6	5.8	3.9	1.9	1.7	1.6	1.2
16	.4	.6	14.0	7.6	7.3	23.6	5.5	3.7	1.7	1.7	1.8	1.5
17	.8	.9	13.1	6.8	11.4	24.4	6.0	3.5	1.6	1.5	2.1	1.6
18	1.2	2.1	12.9	6.4	13.2	24.5	6.6	3.3	1.5	1.2	2.0	1.5
19	1.0	3.7	12.8	6.0	14.2	23.8	8.3	3.1	1.3	1.2	1.6	1.3
20	.8	3.2	12.2	5.5	14.3	23.1	9.9	2.8	1.2	1.6	1.3	1.1
21	.7	3.4	10.8	5.2	12.8	22.8	10.2	2.6	1.1	1.7	1.1	.9
22	6.3	3.5	9.0	5.2	9.6	22.6	10.0	2.6	1.1	1.5	1.0	.7
23	7.8	3.3	9.1	5.4	7.5	22.4	9.8	2.8	1.0	1.2	1.4	.6
24	6.8	2.8	12.5	5.6	6.4	21.9	9.5	2.5	1.0	1.0	1.4	.4
25	5.5	2.3	13.5	5.3	5.7	20.7	8.8	2.6	.9	.8	1.3	.4
26	4.3	2.0	14.6	4.8	5.5	18.2	9.1	3.2	.9	.8	1.4	.3
27	3.3	1.6	15.0	4.5	7.2	14.7	11.4	3.6	.8	.9	1.4	.9
28	2.6	1.6	15.0	4.2	6.3	11.0	11.2	4.2	.8	1.1	1.3	.8
29	2.2	1.9	14.8	3.9	6.2	8.8	11.4	4.8	1.1	1.4	1.2	.7
30	1.9	2.2	14.2	3.7	.....	7.7	12.0	4.8	1.3	1.2	1.2	.6
31	1.6	.....	12.8	3.5	.....	6.9	.....	4.4	.....	1.1	1.2	.....
1881.												
1	.5	.8	10.7	4.4	5.4	7.4	6.9	8.2	2.2	1.4	.7	.4
2	.8	.5	15.4	4.0	5.3	7.4	6.5	7.6	2.2	1.4	.7	.3
3	1.3	.4	16.4	3.5	5.4	7.3	6.3	7.3	2.1	1.4	.6	.3
4	1.6	.5	16.2	3.0	5.5	7.1	6.2	6.6	2.0	1.3	.5	.3
5	1.3	.7	16.9	2.8	6.9	6.6	6.2	6.4	2.1	1.4	.5	.4
6	1.1	.9	18.1	3.1	7.8	6.1	6.0	6.8	2.1	1.7	.5	.3
7	.9	1.4	17.5	3.9	7.8	5.7	5.7	7.8	2.4	1.9	.4	.4
8	.7	1.6	15.9	5.1	7.4	5.4	5.8	6.6	2.5	1.9	.4	.4
9	.6	1.2	14.6	6.4	7.7	5.1	6.1	6.0	3.0	1.7	.3	.4
10	.5	1.7	13.7	7.7	8.2	5.0	6.0	5.8	3.8	1.5	.4	.3
11	.4	3.1	12.2	8.9	9.8	4.8	5.7	5.3	3.4	1.3	.4	.2
12	.3	3.3	10.2	9.5	11.6	4.8	6.0	5.0	3.2	1.1	.4	.1
13	.3	2.9	8.0	9.4	12.5	4.6	8.6	4.8	3.2	1.0	.5	.1
14	.3	2.8	6.6	9.3	13.1	4.6	12.5	4.4	3.2	.9	.7	.0
15	.3	2.8	5.6	9.2	13.6	4.5	13.6	4.0	2.8	.8	1.3	.3
16	.2	2.7	5.2	8.9	13.8	4.8	13.6	3.7	2.4	.7	1.2	.3
17	.2	2.5	6.0	8.3	13.4	10.2	13.6	3.5	2.2	.7	1.0	.6
18	.2	2.3	6.8	7.6	12.1	14.1	13.4	3.3	2.1	.8	.8	.5
19	.2	2.1	7.1	7.3	11.4	15.3	12.6	3.0	2.2	.8	.6	.5
20	.1	1.8	6.9	7.8	12.0	17.2	11.1	2.8	2.2	.9	.5	.5
21	.1	1.6	7.0	11.0	10.6	17.4	9.4	2.6	2.2	.9	.5	.4
22	.0	1.3	6.9	12.1	10.4	16.7	8.3	2.5	2.0	.9	.5	3.6
23	.0	1.2	6.5	12.4	10.7	16.2	7.4	3.1	1.9	.8	.5	6.4
24	.1	1.1	6.0	13.0	10.6	15.1	6.8	3.1	1.8	.9	.5	5.8
25	.1	.9	5.6	13.4	10.2	13.2	6.5	3.0	1.6	1.1	.4	4.4
26	.1	.8	5.4	13.0	9.1	11.0	6.4	3.3	1.6	.9	.4	3.3
27	.0	.8	5.5	11.8	8.0	9.2	7.1	3.2	1.7	.8	.3	2.5
28	.1	.9	5.4	9.9	7.4	8.0	8.2	3.1	1.6	.6	.3	2.0
29	.1	3.6	5.2	8.1	.....	7.4	8.8	2.8	2.0	.6	.4	1.6
30	.5	7.5	5.1	6.8	.....	7.1	8.7	2.6	1.5	.6	.4	1.6
31	1.3	.....	4.7	6.0	.....	7.2	.....	2.5	.....	.8	.4	.....

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Daily gage height, in feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1872–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1882.												
1	1.5	1.4	5.4	11.4	20.6	11.5	9.9	6.6	6.4	2.9	2.2	2.6
2	1.4	1.8	4.6	11.4	19.6	12.4	9.5	5.9	6.7	2.9	2.2	2.8
3	1.4	2.3	4.0	11.0	19.2	12.7	8.7	5.3	6.4	2.9	2.4	3.2
4	1.4	5.0	3.7	10.2	20.2	13.4	7.8	4.9	6.3	3.4	3.2	3.9
5	1.4	5.8	3.8	9.2	21.8	14.0	7.0	4.5	6.7	3.6	3.3	4.0
6	1.2	5.5	4.4	8.8	21.4	14.5	6.4	4.2	6.6	4.2	3.7	4.0
7	1.0	5.0	4.4	11.4	20.0	15.2	6.0	4.0	6.0	4.5	4.0	3.4
8	.9	4.1	4.2	13.5	19.0	13.9	6.0	3.8	5.6	4.2	4.0	3.0
9	.8	4.0	4.0	15.3	19.1	14.7	7.4	3.6	5.0	4.0	3.8	2.8
10	.7	4.3	3.6	16.6	19.3	18.0	7.0	3.6	4.4	3.6	3.6	2.8
11	.6	4.0	3.2	18.4	18.8	17.0	6.8	8.0	3.9	3.2	3.1	2.4
12	.6	4.2	3.0	19.8	17.8	16.0	6.8	6.2	3.5	2.9	2.9	2.6
13	.5	4.9	2.7	20.6	17.7	15.8	7.0	5.3	3.2	3.0	2.7	2.8
14	.4	5.2	2.6	23.2	19.9	15.6	7.0	5.0	2.9	3.0	2.5	5.0
15	.4	5.2	3.1	22.9	19.3	14.6	6.6	5.2	2.8	2.4	2.4	10.0
16	.4	5.0	5.0	23.8	18.3	13.2	6.2	5.0	2.7	2.4	2.2	11.7
17	.4	4.7	8.0	26.0	17.5	11.8	5.7	4.7	2.7	2.5	2.4	11.5
18	.4	4.3	10.5	26.7	16.9	10.4	5.2	4.7	3.0	3.1	2.6	9.4
19	.4	3.8	11.0	27.9	16.4	9.3	5.0	5.3	3.0	3.8	2.1	6.6
20	.4	3.3	10.8	27.3	15.7	8.6	4.7	5.6	3.1	3.4	2.0	4.7
21	.4	3.0	9.9	28.4	15.2	8.3	4.5	5.2	4.1	3.1	2.2	3.7
22	.4	2.8	9.6	29.6	14.8	8.1	4.4	5.1	5.0	2.6	2.8	3.0
23	.4	2.8	12.0	28.7	13.6	7.9	5.6	5.3	4.9	2.5	2.8	2.7
24	.5	4.6	14.4	28.0	12.4	7.6	8.0	4.7	4.3	2.5	2.6	2.6
25	.5	4.4	15.2	26.9	11.2	7.4	8.6	4.2	3.8	2.5	2.2	2.4
26	.5	4.4	15.4	25.6	10.2	7.2	9.0	4.0	3.6	2.4	2.2	2.3
27	.5	5.8	14.6	25.0	9.3	7.2	8.7	4.2	3.6	2.2	2.2	2.2
28	.6	6.7	13.5	24.7	9.1	7.8	8.1	4.3	3.4	2.2	2.0	2.0
29	.8	6.8	12.2	25.6	.....	8.3	7.7	5.4	3.1	2.1	2.0	2.0
30	1.2	6.3	11.5	23.9	.....	8.8	7.3	5.6	3.0	2.3	2.1	1.8
31	1.1	.....	11.3	21.8	.....	9.6	.....	6.2	.....	2.1	2.4	.....
1883.												
1	1.7	1.4	2.4	3.6	12.2	7.8	7.1	16.4	2.8	2.2	1.1	.8
2	1.6	1.3	2.6	3.2	9.7	7.2	9.0	13.8	2.6	2.4	1.2	.8
3	1.6	1.2	2.8	2.8	7.3	6.5	11.2	10.8	2.5	2.4	1.3	.8
4	1.6	1.2	2.9	2.8	6.8	6.0	13.1	8.8	2.4	2.2	1.0	.8
5	1.6	1.4	2.7	2.8	6.2	5.5	14.2	7.5	2.4	2.1	1.0	.8
6	1.6	1.6	2.4	3.0	6.2	5.2	14.7	6.6	2.2	2.0	.9	.8
7	1.6	1.6	2.2	3.7	6.3	6.0	14.9	6.0	2.2	1.8	.9	.7
8	1.5	1.5	2.0	5.6	7.3	7.5	14.6	5.5	2.1	1.7	1.0	.7
9	1.5	1.4	1.9	7.0	7.3	7.5	13.2	5.0	2.3	1.6	1.0	.6
10	1.4	1.3	1.9	8.6	8.1	7.6	13.1	4.8	2.5	1.5	1.0	.6
11	1.4	1.3	1.8	9.2	10.0	7.9	13.0	4.4	3.3	1.7	1.0	.5
12	1.4	1.3	1.8	9.1	11.2	7.9	13.3	4.2	3.6	1.7	1.0	.5
13	1.4	1.2	1.8	8.3	12.0	7.3	14.5	4.0	4.2	1.7	1.0	.4
14	1.4	1.2	1.8	7.4	11.5	6.7	14.0	3.8	5.0	1.8	1.0	.4
15	1.3	1.2	1.8	8.0	10.7	6.4	13.6	3.8	4.5	1.8	.9	.4
16	1.2	1.2	2.0	9.0	10.3	6.0	13.5	3.6	4.8	2.2	1.1	.4
17	1.2	1.2	2.1	10.4	10.0	5.6	13.1	3.5	4.8	2.2	1.2	.4
18	1.2	1.4	2.1	11.8	9.6	5.1	12.2	3.3	4.7	2.0	1.1	.4
19	1.2	1.6	2.1	12.5	9.0	4.8	12.0	3.2	4.2	1.9	1.0	.4
20	1.2	1.7	2.2	13.2	8.4	4.5	12.0	3.1	3.7	1.7	1.1	.4
21	1.2	1.7	2.0	16.2	7.9	4.3	11.5	3.1	3.2	1.6	1.3	.4
22	1.2	1.7	2.0	18.2	7.8	4.0	11.1	3.1	2.8	1.6	1.4	.4
23	1.2	1.7	2.2	18.4	7.8	3.9	12.2	3.0	2.5	1.5	1.4	.4
24	1.6	1.7	2.8	18.4	7.8	3.7	14.0	2.9	2.2	1.4	1.3	.4
25	2.1	1.7	3.6	18.8	9.3	3.7	15.2	2.8	2.2	1.2	1.1	.4
26	2.1	1.8	5.3	19.6	9.3	3.6	15.8	3.0	2.2	1.2	1.0	.4
27	1.9	1.7	6.4	20.0	8.8	3.9	16.5	3.0	2.2	1.0	.9	.6
28	1.8	1.7	6.3	20.3	8.3	4.4	16.9	3.1	2.5	1.0	.8	1.0
29	1.6	1.8	5.7	19.4	.....	4.7	17.5	2.9	2.4	.9	.8	1.0
30	1.5	2.1	4.9	17.0	.....	4.8	17.5	2.8	2.2	.9	.8	1.0
31	1.4	.....	4.2	14.6	.....	5.1	.....	2.8	.....	1.0	.8	.....

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Daily gage height, in feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1872–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1884.												
1	1.2	1.3	4.8	7.8	11.0	9.1	13.0	11.3	3.1	7.4	3.0	1.0
2	1.3	1.2	4.1	6.8	12.0	8.4	11.2	10.4	3.0	7.7	4.0	1.0
3	1.3	1.2	3.5	6.1	13.0	8.1	10.3	9.6	2.7	6.8	4.7	1.0
4	1.1	1.5	3.1	5.6	14.2	7.8	8.8	9.0	2.7	5.9	5.3	1.4
5	1.0	1.8	2.8	5.1	15.0	7.7	8.0	8.6	2.6	5.3	6.4	1.4
6	1.0	1.8	2.4	4.8	15.4	12.5	7.5	8.8	2.6	5.0	6.3	1.2
7	1.0	1.5	2.3	4.5	16.5	14.7	7.0	9.3	2.6	4.9	4.4	1.1
8	.9	1.3	2.4	4.1	17.6	19.1	6.7	9.3	2.6	4.7	3.9	1.1
9	.9	1.2	4.2	3.6	20.7	21.0	6.2	9.2	3.0	4.3	3.3	1.0
10	1.0	1.0	4.5	3.4	21.4	21.3	6.0	8.8	3.5	4.3	2.7	.9
11	1.2	1.3	4.4	3.2	22.5	21.2	5.5	7.9	3.9	4.9	2.3	.8
12	2.8	1.8	4.1	5.2	22.5	23.2	5.3	7.1	3.7	4.4	2.0	.8
13	2.6	2.8	3.7	6.2	23.0	24.6	5.2	6.3	4.0	4.1	1.9	.8
14	2.0	2.4	3.5	6.7	24.0	25.2	5.5	5.7	5.0	3.8	1.9	.8
15	1.5	2.1	3.2	9.0	24.2	25.2	14.2	5.3	6.0	4.1	2.0	.8
16	1.3	1.9	3.0	11.2	24.0	24.9	14.1	4.9	6.2	3.8	2.0	.8
17	1.1	2.0	2.7	10.8	23.7	24.5	13.5	4.6	6.2	3.8	1.9	.8
18	1.0	2.0	2.7	10.8	23.2	24.0	13.2	4.4	5.8	3.4	1.7	.8
19	.9	1.9	2.7	11.6	22.6	23.3	13.6	4.2	5.2	3.0	1.6	.7
20	.9	1.6	3.3	12.6	22.0	22.4	13.5	4.0	4.6	2.6	1.5	.6
21	.9	1.5	3.8	12.4	21.2	21.0	12.0	3.7	4.1	2.3	1.3	.6
22	.8	1.6	3.9	12.1	20.4	19.0	10.8	3.5	3.7	2.2	1.3	.6
23	.8	2.8	4.0	11.9	19.7	17.5	10.2	3.5	3.3	2.2	1.1	.6
24	.8	4.2	4.9	12.9	19.0	17.5	10.1	3.2	2.9	2.2	1.1	.6
25	.8	6.1	9.0	13.4	18.0	17.3	10.6	3.2	2.6	2.0	1.0	.6
26	.6	8.4	8.8	12.9	16.0	17.4	10.5	3.2	2.6	1.8	1.0	.6
27	.6	9.5	8.6	11.3	13.5	17.3	10.6	3.1	2.7	1.6	1.0	.6
28	.6	8.7	9.2	10.8	11.4	17.0	11.3	3.0	3.0	1.8	1.1	.5
29	1.1	7.2	9.7	9.7	10.2	16.1	12.7	3.0	3.3	2.0	1.1	.5
30	1.8	5.8	9.7	9.0	.....	15.3	12.1	3.0	5.4	2.5	1.1	.5
31	1.8	.....	8.8	8.3	.....	14.2	.....	3.2	.....	2.6	1.0	.....
1885.												
1	.4	.6	.8	3.4	8.9	7.8	4.5	3.4	9.5	2.7	1.6	.8
2	.4	.5	.8	3.0	8.0	7.5	4.6	3.2	10.2	2.8	1.9	.8
3	.4	.5	.8	2.8	7.0	7.2	4.8	3.0	11.3	3.1	1.9	.7
4	.4	.4	.8	2.6	6.3	6.8	5.3	3.0	11.3	3.2	1.6	.7
5	.4	.4	.8	2.5	5.8	6.4	5.4	2.9	10.2	3.2	1.5	.7
6	.4	.4	.8	2.8	5.5	6.2	5.1	2.8	8.0	3.0	1.5	.8
7	.4	.4	.8	3.8	5.3	6.0	5.0	2.8	6.3	4.0	1.4	.8
8	.4	.4	.8	4.4	5.2	5.8	5.0	2.8	5.2	3.7	1.4	.8
9	.4	.4	.8	5.0	5.4	5.4	4.9	2.8	4.5	3.5	1.6	.7
10	.4	.4	.8	5.3	5.9	4.9	4.6	2.8	4.2	3.8	1.6	.7
11	.4	.4	.8	5.7	6.7	4.5	4.4	2.8	4.0	3.8	1.4	.7
12	.4	.4	.8	6.2	6.4	4.2	4.1	3.5	3.6	3.6	1.4	.7
13	.4	.4	1.0	8.3	6.7	4.1	3.9	3.6	4.0	3.5	1.5	.7
14	.4	.4	1.3	9.3	7.2	4.3	3.8	3.6	4.4	4.0	1.5	.7
15	.3	.4	1.5	11.6	7.2	4.2	3.5	3.2	4.0	3.5	1.3	.7
16	.3	.4	1.9	14.0	7.2	4.4	3.2	3.0	3.7	3.1	1.2	.6
17	.3	.4	2.0	16.2	7.0	4.6	3.1	2.7	3.3	2.8	1.4	.6
18	.3	.4	2.5	17.6	6.5	5.2	3.7	2.4	3.5	2.5	1.8	.6
19	.3	.4	2.6	17.7	6.5	6.0	4.5	2.4	3.5	2.5	2.4	.6
20	.3	.4	2.8	17.8	5.9	6.4	4.6	2.2	3.0	2.8	2.4	.6
21	.3	.4	3.2	17.7	5.5	6.4	4.5	2.2	3.0	2.8	2.0	.6
22	.3	.4	5.6	17.4	5.2	6.0	7.4	2.2	4.5	2.5	1.7	.6
23	.3	.4	6.2	16.1	4.8	5.6	9.3	2.1	4.5	2.0	1.4	.6
24	.2	.4	8.1	14.4	5.0	5.2	8.4	2.1	4.0	1.8	1.3	.6
25	.2	.4	9.8	11.2	5.2	4.8	6.8	2.8	3.2	1.7	1.1	.8
26	.2	.4	9.6	10.9	6.8	4.5	5.5	3.1	3.0	1.7	1.0	1.0
27	.2	.5	8.5	11.4	7.6	4.3	4.7	4.0	3.2	1.7	.9	1.0
28	.2	.6	7.2	12.1	7.9	4.1	4.2	5.4	3.5	1.8	.9	1.0
29	.3	.6	5.8	11.8	.....	4.1	3.8	6.6	3.1	1.6	.8	1.0
30	.5	.8	4.8	11.2	.....	4.6	3.6	7.3	3.0	1.6	.8	1.3
31	.5	.....	4.0	10.1	.....	4.6	.....	9.0	.....	1.6	.7	.....

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Daily gage height, in feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1872–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1886.												
1	1.1	4.8	3.5	3.7	9.0	7.3	22.5	4.5	5.6	5.9	2.0	1.8
2	1.2	9.0	3.5	3.7	8.3	7.9	23.8	4.3	5.3	5.4	2.0	1.8
3	1.4	10.0	3.4	4.8	8.0	8.0	24.2	4.3	5.3	5.1	2.3	2.1
4	2.1	9.7	3.4	8.4	7.8	7.5	24.3	4.3	5.3	6.0	2.5	2.3
5	5.1	8.2	3.3	12.4	7.3	7.0	24.8	4.8	5.1	7.0	4.1	2.3
6	4.6	6.9	3.6	14.1	6.7	6.4	26.4	5.8	5.1	7.7	5.2	2.0
7	3.7	6.8	3.7	15.0	6.2	5.8	27.5	7.3	5.1	7.7	5.0	1.7
8	3.0	10.0	3.8	15.3	5.8	5.5	28.1	8.7	5.3	7.7	4.5	1.6
9	2.6	13.6	5.2	15.3	5.4	5.0	28.0	8.3	5.6	8.2	4.3	1.3
10	2.1	14.9	5.8	14.5	5.2	4.6	27.6	8.2	6.2	8.8	4.3	1.2
11	1.7	15.8	6.4	13.0	5.0	4.4	26.8	9.5	7.0	9.0	4.2	.9
12	1.4	16.3	7.4	10.4	6.2	4.2	26.0	10.6	7.2	8.6	3.8	.9
13	1.2	16.5	8.3	8.1	6.8	4.0	25.3	9.8	8.4	7.5	3.4	.9
14	1.1	16.1	8.8	6.4	7.8	4.0	23.9	9.5	8.8	6.5	2.9	1.8
15	1.0	14.4	9.5	5.1	9.5	3.9	21.9	8.0	8.3	6.2	2.5	2.3
16	1.0	10.9	11.0	4.8	10.0	3.9	18.7	6.4	8.0	5.9	2.3	2.3
17	1.1	8.0	12.4	5.8	9.4	3.9	14.4	5.5	8.0	5.2	2.3	1.8
18	2.6	6.7	13.1	7.2	8.4	3.9	10.8	5.0	8.0	4.6	2.2	1.5
19	3.1	5.7	13.1	8.8	7.8	3.9	8.8	4.5	8.5	4.4	2.1	1.5
20	2.9	5.3	12.1	10.2	7.0	3.9	7.6	4.7	8.5	4.4	2.1	1.4
21	2.3	4.9	10.0	10.4	6.4	5.5	6.9	5.4	10.0	4.2	2.2	1.4
22	2.0	4.6	7.9	10.4	5.8	6.5	6.3	5.8	9.0	3.7	2.2	1.3
23	1.8	4.3	6.5	10.4	5.4	6.9	5.9	6.2	8.4	3.3	2.4	1.2
24	1.7	4.3	5.8	10.3	5.1	8.6	5.5	6.7	9.5	3.0	2.3	1.2
25	1.7	4.1	5.3	10.8	5.1	9.7	5.2	7.0	11.0	2.9	2.5	1.2
26	1.7	4.1	5.1	11.6	5.7	9.9	5.0	6.9	10.8	2.9	2.5	1.1
27	1.7	4.1	4.7	11.9	6.3	9.5	4.8	6.6	9.7	2.7	2.5	1.0
28	1.5	4.1	4.5	11.9	6.5	10.8	4.6	6.3	8.6	2.6	2.3	.9
29	1.5	3.8	4.4	11.5	.....	11.7	4.6	6.3	8.0	2.5	2.1	.9
30	1.5	3.6	3.9	10.4	.....	15.8	4.6	6.2	7.0	2.4	2.0	.9
31	2.0	.....	3.8	9.6	.....	20.9	.....	5.8	.....	2.1	2.0	.....
1887.												
1	.8	.5	7.7	7.0	13.0	17.5	4.7	7.1	2.4	1.4	1.5	2.9
2	.7	.6	6.3	6.5	12.4	17.4	4.9	6.4	2.6	1.3	1.6	2.8
3	.7	.7	5.1	6.0	11.8	17.3	4.9	7.0	3.6	1.2	1.6	2.3
4	.7	.7	4.2	6.0	12.1	16.6	4.8	7.8	5.5	1.2	1.5	1.8
5	.7	.7	3.5	6.9	11.9	15.1	4.7	7.4	6.4	1.2	1.8	1.6
6	.7	.7	3.2	6.9	11.9	12.5	4.6	6.4	6.2	1.4	4.4	1.3
7	.7	.7	3.0	6.3	12.8	11.4	4.4	5.4	5.6	1.8	5.2	1.1
8	.7	.6	2.8	5.7	13.3	10.9	4.4	5.0	5.0	1.9	5.0	1.0
9	.7	.6	2.8	5.0	12.6	10.2	4.4	4.7	4.7	2.2	4.9	.9
10	.6	.5	2.7	4.5	12.3	10.8	4.3	4.3	4.6	2.7	4.6	.9
11	.6	.5	2.5	4.4	11.1	12.6	4.2	4.5	4.3	2.6	3.8	.8
12	.6	.5	2.7	4.2	10.0	13.8	4.0	4.7	3.8	2.4	3.3	.8
13	.6	.5	3.2	3.9	9.0	14.3	3.7	4.6	3.5	2.0	3.0	.8
14	.6	.5	3.8	3.9	7.6	14.0	3.6	4.3	3.2	2.0	2.8	.8
15	.5	.6	4.5	4.3	7.8	12.8	3.4	4.2	3.0	1.6	2.6	.8
16	.5	.6	6.0	5.0	8.8	10.8	3.2	4.3	2.6	1.4	2.2	.7
17	.5	1.0	7.3	5.6	9.8	9.0	3.0	4.3	2.4	1.4	1.9	.6
18	.5	1.6	8.5	5.8	10.8	7.6	3.0	4.2	2.0	1.2	1.6	.6
19	.5	2.2	10.4	5.5	11.0	6.7	2.9	4.0	1.8	1.1	1.4	.6
20	.5	1.5	9.7	5.2	11.2	6.1	3.0	3.6	1.6	1.0	1.4	.6
21	.5	1.7	9.2	4.8	12.8	5.6	3.0	3.2	1.6	1.0	1.5	.5
22	.5	5.0	9.9	4.4	13.9	5.3	3.4	3.0	1.7	.9	1.4	.5
23	.5	6.3	9.5	4.6	14.5	5.1	5.5	2.8	1.7	1.0	1.8	.5
24	.5	5.7	8.5	7.5	17.4	4.8	8.2	2.8	1.5	.9	2.0	.5
25	.5	5.8	7.4	10.3	17.3	4.6	10.8	2.8	1.4	1.0	2.0	.5
26	.5	7.3	7.0	12.7	16.8	4.3	12.0	2.9	1.4	1.2	2.0	.5
27	.5	8.0	6.0	13.8	17.3	4.2	12.3	2.8	1.8	1.4	1.6	.7
28	.5	8.4	5.7	14.3	17.5	4.1	11.9	2.6	1.8	1.6	1.5	.5
29	.5	8.7	7.1	15.1	.....	4.3	10.3	2.4	1.8	1.5	1.5	.5
30	.5	8.5	8.1	16.3	.....	4.3	8.6	2.4	1.6	1.5	1.4	.6
31	.5	.....	8.0	14.9	.....	4.4	.....	2.4	.....	1.5	2.4	.....

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Daily gage height, in feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1872–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1888.												
1	0.7	2.2	0.6	7.1	5.0	8.3	18.2	3.1	4.4	4.8	0.7	2.0
2	.8	1.9	.6	10.0	4.6	7.4	17.7	3.1	4.6	5.1	.7	2.4
3	.8	1.6	.6	11.1	4.5	6.4	17.4	3.1	5.2	4.8	.7	2.6
4	1.0	1.3	.6	12.0	4.4	5.8	16.4	3.1	5.9	4.3	.7	4.2
5	1.4	1.1	.6	11.8	4.9	5.6	14.6	3.0	6.0	3.9	.8	5.4
6	1.5	1.0	.7	10.3	5.5	5.9	12.0	2.9	5.5	3.1	1.2	5.5
7	1.4	.9	.7	8.4	5.8	5.6	9.6	2.7	4.8	2.7	1.2	5.2
8	1.2	.8	.8	7.0	6.0	5.2	8.0	2.6	4.1	2.6	1.1	5.2
9	.9	.8	1.0	6.5	6.9	4.8	7.1	2.8	3.6	2.4	1.2	5.5
10	.8	.8	1.0	6.9	7.0	4.6	7.6	2.7	3.2	2.3	1.4	5.6
11	.8	.8	1.2	7.2	7.5	4.8	9.7	2.5	3.0	2.2	1.3	6.2
12	.6	.8	1.6	7.4	8.8	6.1	11.2	2.5	2.7	2.1	1.2	6.2
13	.5	.7	2.4	9.5	9.4	6.0	13.0	2.7	2.6	1.9	1.1	5.9
14	.5	.7	2.6	10.8	9.7	5.8	13.8	3.0	2.5	1.8	1.0	6.2
15	.5	.7	2.2	11.2	9.2	5.6	13.6	3.1	2.5	1.8	1.1	7.0
16	.5	.7	2.2	12.2	8.6	5.4	12.2	3.0	2.4	2.0	1.2	6.8
17	.5	.8	2.3	12.8	7.8	5.0	9.8	3.0	2.4	2.0	1.2	5.8
18	.5	.8	2.3	14.6	7.2	4.8	8.1	2.8	2.3	1.8	1.1	5.1
19	.5	.8	2.6	15.6	6.6	4.5	6.8	2.6	2.2	1.6	1.1	5.7
20	.5	.7	2.9	16.2	6.2	4.3	6.1	2.4	2.0	1.5	1.1	6.9
21	.5	.7	3.0	16.4	6.2	4.3	5.6	2.7	2.0	1.5	1.0	7.2
22	.5	.7	3.0	16.5	6.0	4.5	5.2	3.0	2.0	1.5	.9	6.6
23	.5	.7	2.8	16.1	5.9	5.0	4.8	3.3	1.9	1.4	.9	6.0
24	.7	.7	2.6	14.6	5.9	5.0	4.4	3.4	1.8	1.4	.8	5.2
25	.7	.6	2.4	12.0	6.6	5.4	4.2	3.6	1.8	1.3	1.4	4.4
26	.8	.6	2.3	9.6	7.9	14.9	4.0	4.9	1.8	1.2	3.0	4.6
27	.8	.6	2.2	8.2	9.2	18.2	3.7	6.5	2.0	1.2	3.0	4.4
28	1.0	.6	2.1	7.0	9.8	20.3	3.5	6.8	3.6	1.0	2.7	4.0
29	1.4	.6	2.3	6.4	9.2	20.5	3.4	6.4	4.4	.9	2.2	4.1
30	2.0	.6	2.8	5.8	.....	20.2	3.3	5.6	4.5	.8	2.1	3.0
31	2.3	.....	3.2	5.4	.....	19.1	.....	4.8	.....	.7	1.8	.....
1889.												
1	2.5	9.9	4.0	3.5	10.0	7.0	4.4	2.5	1.6	2.4	5.8	2.6
2	2.2	8.2	3.8	4.6	9.1	6.6	4.2	2.7	2.0	2.6	5.8	2.9
3	2.0	6.6	3.6	4.9	8.3	7.1	4.0	2.9	4.0	3.0	5.7	3.8
4	1.8	5.6	3.4	5.0	7.2	7.4	3.8	2.8	5.6	3.5	5.9	5.2
5	1.6	5.0	3.2	5.3	6.7	7.3	3.7	2.7	7.3	4.0	6.6	5.0
6	1.5	4.6	3.0	7.4	5.8	7.0	3.6	2.6	7.0	4.0	6.9	8.0
7	1.4	4.4	2.9	8.4	5.4	6.7	3.5	2.6	5.4	4.4	6.6	7.9
8	1.5	4.3	2.8	8.6	5.0	6.4	3.4	2.7	4.2	4.9	6.4	8.4
9	1.4	5.3	2.6	9.4	4.6	6.0	3.2	2.8	3.8	5.0	6.2	7.8
10	1.5	6.5	2.6	10.4	4.5	5.6	3.0	2.7	3.1	4.5	5.6	6.3
11	1.4	9.6	2.4	10.4	4.2	5.3	2.8	2.4	2.8	3.9	4.9	5.0
12	1.4	12.3	2.4	10.1	4.0	4.8	2.7	2.3	2.8	3.3	4.4	3.9
13	1.4	13.4	2.3	9.6	3.8	4.6	2.7	2.2	2.8	4.3	4.0	3.4
14	1.4	13.2	2.3	8.8	3.7	4.4	2.7	2.0	2.9	8.7	3.6	3.0
15	1.4	12.1	2.3	8.1	3.8	4.2	4.2	1.8	3.0	4.8	3.5	2.8
16	1.8	10.0	2.3	7.4	7.5	4.0	5.8	1.7	3.5	4.5	3.8	2.6
17	2.7	8.6	2.3	9.1	14.8	3.8	7.4	1.6	5.2	4.7	3.8	2.4
18	3.0	9.0	2.9	9.6	18.7	3.7	7.6	1.6	7.0	4.7	4.2	2.2
19	3.0	9.8	3.1	9.2	19.6	3.8	6.8	1.6	7.5	4.4	4.7	2.5
20	2.6	9.9	3.2	8.9	19.7	5.1	5.6	1.6	7.6	4.3	4.6	4.8
21	2.5	9.5	3.5	8.5	19.6	8.0	5.0	1.8	7.5	4.3	4.2	5.7
22	2.3	8.4	4.2	8.1	18.9	9.0	4.4	1.8	7.4	4.1	3.8	5.2
23	2.2	7.4	4.7	7.6	18.8	8.3	4.0	1.7	6.7	3.6	3.3	4.3
24	2.1	6.6	4.8	7.4	18.5	7.3	3.6	1.6	5.8	3.0	3.0	3.8
25	2.4	6.0	4.4	7.3	17.1	6.6	3.4	1.4	5.1	2.6	2.6	3.8
26	2.9	5.5	4.0	7.3	14.4	6.3	3.2	1.2	4.4	2.6	2.5	4.6
27	4.8	5.1	3.6	8.1	10.8	5.7	2.8	1.2	3.8	3.0	2.4	5.5
28	8.2	4.9	3.4	9.3	7.8	5.3	2.7	1.2	3.1	2.9	2.6	5.5
29	10.6	4.4	3.2	9.6	.....	5.0	2.6	1.2	2.6	2.6	2.6	5.2
30	11.4	4.2	3.0	10.0	.....	4.8	2.5	1.3	2.4	2.8	2.6	5.0
31	11.3	.....	3.0	10.3	.....	4.6	.....	1.2	.....	4.6	2.7	.....

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Daily gage height, in feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1872–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1890.												
1	4.4	1.8	6.5	2.8	8.8	22.6	11.6	6.8	5.3	2.4	4.4	3.4
2	4.1	1.8	6.3	3.1	8.7	22.2	11.1	6.4	4.8	2.2	4.2	4.0
3	3.6	2.0	6.0	3.3	8.1	23.3	10.4	6.0	4.4	2.1	4.1	4.2
4	3.2	2.2	5.8	3.5	7.3	22.6	11.2	5.8	4.0	2.0	3.7	3.9
5	3.0	2.8	5.6	3.5	6.8	22.9	11.4	5.6	3.7	2.0	3.6	3.4
6	2.8	3.4	5.2	3.5	6.6	23.2	11.1	5.5	3.7	1.9	3.2	3.0
7	2.4	3.8	4.8	3.5	8.1	23.0	11.2	5.5	3.8	1.9	3.8	2.7
8	2.3	4.0	4.4	3.4	14.4	21.9	11.1	5.8	3.8	2.0	3.7	2.4
9	2.2	4.0	4.2	3.5	16.0	19.6	10.7	6.4	3.8	2.1	3.7	2.4
10	2.0	4.4	4.0	3.5	17.2	16.2	10.1	6.4	3.7	2.2	3.8	2.6
11	2.0	5.4	3.8	3.4	17.0	21.8	9.2	6.4	3.8	2.1	4.2	2.5
12	1.9	6.8	3.6	3.4	16.0	10.3	8.3	6.2	3.7	1.9	4.6	2.5
13	1.8	7.5	3.5	3.4	15.0	9.8	8.5	5.9	3.4	1.9	4.7	2.4
14	1.8	7.5	3.4	3.5	13.6	11.7	6.8	5.7	3.2	1.9	4.4	2.6
15	1.6	7.0	3.3	4.2	11.4	11.4	6.4	5.4	3.0	2.1	4.0	2.8
16	1.6	6.8	3.2	8.6	9.8	10.4	6.1	5.1	2.8	2.0	3.6	2.9
17	1.6	7.4	3.0	8.2	8.8	10.3	5.8	4.9	2.8	1.9	3.3	2.8
18	1.6	9.6	3.0	7.7	8.1	10.9	6.0	5.3	2.7	1.8	2.9	2.8
19	1.6	10.6	2.9	7.8	7.6	11.6	6.4	6.0	2.7	1.7	2.6	2.6
20	1.6	11.1	2.8	7.8	7.4	11.8	8.2	6.1	2.6	1.7	2.4	2.6
21	1.6	10.7	2.7	7.2	7.0	11.4	10.6	6.4	2.6	2.1	2.2	2.8
22	1.6	10.0	2.7	7.4	6.4	11.7	11.8	7.0	2.4	2.8	2.2	2.9
23	1.6	9.3	2.7	6.8	6.0	13.6	11.6	7.8	2.4	2.8	2.0	2.8
24	1.6	8.8	2.6	8.0	5.6	14.3	10.3	8.1	2.4	3.2	2.0	3.2
25	1.6	8.4	2.6	9.5	5.8	14.7	9.0	8.3	2.4	3.3	1.9	3.2
26	1.6	8.2	2.6	9.4	6.9	15.2	8.4	8.6	2.4	3.8	1.9	3.9
27	1.6	7.8	2.7	8.8	13.9	15.7	8.2	7.7	2.5	4.0	1.9	3.9
28	1.7	7.7	2.8	7.8	23.2	16.1	8.2	7.0	2.6	4.4	2.8	3.8
29	1.8	7.4	2.7	6.8	.....	15.8	7.6	6.4	2.6	5.0	3.3	3.6
30	1.8	6.9	2.6	7.5	.....	14.3	7.2	6.0	2.5	5.1	3.2	3.4
31	1.8	.....	2.6	8.4	.....	12.2	.....	5.8	.....	4.9	3.1	.....
1891.												
1	3.2	4.8	1.9	8.4	10.8	16.5	14.0	5.0	2.9	3.2	3.9	4.0
2	3.4	4.7	1.9	8.0	12.4	15.3	13.1	4.8	3.3	2.9	6.5	3.8
3	5.6	4.5	1.9	7.4	14.0	14.4	12.8	4.4	3.6	2.7	8.8	3.4
4	6.0	4.2	1.8	7.2	15.8	13.4	12.6	4.3	3.7	2.6	9.2	3.0
5	5.7	4.0	1.8	8.3	15.8	12.5	12.3	4.1	3.6	2.4	10.6	2.6
6	5.2	3.6	1.8	9.6	15.2	12.2	11.9	4.0	3.3	2.3	10.3	2.5
7	4.7	3.4	2.0	10.0	15.8	15.2	11.0	3.8	3.0	2.4	8.6	2.6
8	4.2	3.2	2.2	9.4	16.5	21.8	9.9	3.7	2.9	2.5	6.6	2.8
9	4.0	3.0	2.4	7.8	17.4	21.8	9.1	3.5	2.9	2.5	5.3	2.9
10	3.8	2.8	2.7	6.4	18.8	22.0	8.6	3.4	3.4	2.4	4.3	3.0
11	3.7	2.8	4.1	6.2	19.0	22.1	9.6	3.3	3.6	2.3	3.6	3.1
12	3.6	2.7	5.2	7.4	19.4	21.7	10.0	3.2	3.7	2.6	3.3	3.0
13	3.4	2.6	5.4	7.8	20.6	21.6	10.0	3.1	4.0	3.0	3.0	2.7
14	3.2	2.5	5.0	8.4	21.0	22.0	9.6	3.0	4.5	3.0	2.8	2.4
15	3.0	2.4	4.5	8.7	20.9	22.2	9.2	3.0	4.8	2.7	2.6	2.1
16	2.9	2.4	3.9	8.3	21.2	22.0	9.4	2.9	4.8	2.5	2.5	2.0
17	2.8	2.4	3.4	8.0	21.6	21.2	9.4	2.9	4.4	2.4	2.4	2.0
18	2.6	2.4	3.2	7.6	21.8	19.8	8.6	2.9	4.2	2.3	2.3	2.0
19	2.5	2.3	2.8	7.2	21.5	17.8	7.8	3.0	4.3	2.2	2.2	2.0
20	2.5	2.3	2.7	6.7	20.6	14.9	7.2	3.2	4.4	2.0	2.0	1.9
21	2.6	2.2	2.7	6.4	19.8	12.6	7.2	3.2	4.7	2.0	2.0	1.8
22	2.8	2.2	2.7	7.0	18.6	10.4	6.9	3.2	5.3	2.5	1.9	1.6
23	3.1	2.2	2.7	8.4	17.2	9.4	6.8	3.1	5.4	2.8	1.8	1.5
24	3.6	2.2	2.6	9.8	16.3	8.7	6.7	2.9	5.4	2.6	2.0	1.5
25	4.3	2.2	2.6	12.1	16.1	8.4	6.6	2.8	4.9	2.5	2.4	1.4
26	5.2	2.1	3.0	12.8	16.4	8.6	6.3	2.8	4.8	2.4	2.9	1.4
27	6.1	2.0	3.7	12.2	16.8	9.2	6.0	2.8	4.9	2.2	3.3	1.4
28	6.4	2.0	5.0	11.2	16.9	9.6	5.8	2.7	4.7	2.1	3.6	1.3
29	6.4	2.0	7.1	10.1	.....	10.2	5.6	2.7	4.2	2.3	5.0	1.3
30	5.9	1.9	8.5	9.2	.....	10.7	5.4	2.7	3.6	2.8	5.0	1.2
31	5.3	.....	8.8	8.9	.....	13.4	.....	2.7	.....	3.4	4.4	.....

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Daily gage height, in feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1872–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1892.												
1	1.2	1.0	3.1	7.1	5.6	5.2	7.7	8.6	4.4	5.0	3.0	2.6
2	1.2	1.0	2.6	6.6	5.2	5.0	7.4	7.7	4.4	4.8	3.2	2.4
3	1.2	1.0	2.4	6.6	4.8	4.6	9.3	7.2	5.2	4.5	2.9	2.1
4	1.2	1.0	3.0	6.9	4.6	4.5	8.2	6.6	5.4	4.4	2.8	1.9
5	1.2	1.0	4.0	7.0	4.4	4.3	9.5	6.1	5.2	4.2	2.7	2.0
6	1.1	1.0	4.0	7.0	4.2	4.2	16.2	5.8	5.5	4.7	2.6	1.8
7	1.1	1.0	4.9	7.0	4.8	4.2	22.2	5.6	6.4	5.6	2.8	1.7
8	1.1	1.0	5.8	6.8	7.4	4.5	23.9	5.6	6.7	7.8	3.0	1.6
9	1.1	1.0	6.2	6.9	8.2	5.4	23.6	5.0	6.6	11.2	2.8	1.5
10	1.1	1.3	7.0	7.2	8.1	5.7	23.1	4.8	6.2	12.5	2.4	1.4
11	1.1	1.5	7.5	7.6	8.6	6.0	22.4	4.6	6.0	11.0	2.2	1.4
12	1.1	1.3	7.5	8.2	9.2	6.2	21.6	4.4	5.7	9.8	2.2	1.3
13	1.1	1.2	6.8	10.0	8.8	6.2	21.4	4.2	5.4	9.2	2.2	1.4
14	1.1	1.1	6.0	12.8	8.1	6.2	21.5	4.2	5.3	8.8	2.2	1.5
15	1.1	1.3	5.0	14.8	7.4	5.9	20.8	4.0	5.1	9.2	2.0	1.5
16	1.1	1.6	4.2	15.8	7.0	5.6	18.4	3.8	4.6	8.4	2.1	1.5
17	1.1	2.0	3.8	16.6	6.6	5.6	14.6	3.7	4.0	8.2	2.1	1.4
18	1.1	2.2	3.5	17.4	6.4	6.4	11.0	4.0	3.5	7.3	2.5	1.4
19	1.0	2.2	3.5	18.4	6.5	7.3	9.6	5.3	3.2	6.6	2.4	2.0
20	1.0	1.7	3.5	19.6	6.9	7.6	9.6	4.8	3.0	6.2	2.0	2.8
21	1.0	1.6	3.4	20.0	7.8	7.9	12.3	4.6	3.1	5.8	1.8	3.5
22	1.0	1.8	3.0	19.8	8.9	8.1	15.6	4.6	3.3	5.5	1.8	3.8
23	1.0	2.8	2.9	18.6	9.0	8.2	15.7	4.7	4.6	5.1	2.0	3.2
24	1.0	2.6	2.9	17.0	8.8	8.8	14.4	4.8	5.4	4.6	2.0	3.0
25	1.0	2.4	3.3	15.0	8.2	8.4	12.9	4.8	5.2	4.2	2.6	2.6
26	1.0	2.7	4.1	13.2	7.4	8.6	11.6	5.0	5.4	3.8	2.4	2.1
27	1.0	3.6	6.2	10.0	6.8	8.7	10.6	5.3	5.0	3.6	2.2	1.8
28	1.0	4.1	7.4	8.8	6.1	8.6	10.2	5.6	5.0	3.4	2.4	1.8
29	1.0	4.0	8.5	7.5	5.6	8.5	10.0	5.0	5.2	3.1	2.6	2.0
30	1.0	3.6	8.9	6.7	.....	8.4	9.6	4.6	5.0	2.9	2.8	2.0
31	1.0	.....	8.0	6.1	.....	8.1	.....	4.4	.....	2.8	2.8	.....
1893.												
1	1.8	.8	2.8	3.4	4.0	8.3	4.4	8.4	13.0	3.0	1.8	1.1
2	1.6	.8	2.8	3.7	5.0	7.6	4.3	9.0	12.8	2.8	1.6	1.5
3	1.5	1.0	3.2	3.7	7.0	7.2	4.2	10.2	11.8	2.6	1.6	4.4
4	1.4	1.1	3.4	3.7	8.0	7.7	4.0	13.0	10.0	2.5	1.5	4.1
5	1.3	1.3	3.5	3.8	7.4	8.4	4.1	13.8	9.6	2.6	1.6	3.6
6	1.3	1.2	3.4	4.3	6.4	8.2	4.3	14.8	14.0	2.8	1.8	3.5
7	1.2	1.2	3.2	4.4	6.0	7.8	4.5	16.0	14.0	2.8	2.0	3.4
8	1.2	1.2	3.1	4.1	5.6	7.7	4.6	16.6	13.8	2.6	1.9	3.2
9	1.1	1.7	3.2	4.0	5.3	7.6	4.4	17.0	13.4	2.4	2.0	2.8
10	1.1	1.9	3.3	3.6	5.1	7.8	4.2	17.1	13.7	2.2	2.4	2.4
11	1.1	2.4	3.2	3.3	5.6	8.2	4.0	16.3	13.2	2.3	2.4	2.6
12	1.0	3.0	2.8	3.0	8.5	9.0	4.1	14.0	11.9	2.2	2.2	2.2
13	1.1	3.9	2.7	2.6	10.4	9.8	11.0	11.4	9.4	2.1	2.0	1.9
14	1.1	4.2	3.2	2.5	12.7	9.8	15.2	8.9	7.2	2.0	2.0	1.8
15	1.0	3.8	3.8	2.4	14.4	9.7	18.2	7.8	6.0	1.9	2.1	2.8
16	1.0	3.2	3.8	2.4	16.6	9.0	17.2	7.4	5.2	1.8	2.0	6.4
17	1.0	3.0	6.8	2.4	20.7	7.4	15.0	7.0	4.7	1.8	1.8	7.3
18	1.0	3.2	7.6	2.0	20.7	7.3	11.5	6.7	4.4	1.7	1.6	6.6
19	1.0	3.8	7.9	2.0	20.7	6.6	9.2	7.0	4.1	1.7	1.7	5.6
20	1.0	4.2	9.2	2.0	20.7	6.0	7.6	7.2	4.0	1.7	2.4	4.6
21	1.0	4.4	10.2	2.1	20.2	5.6	7.2	6.5	3.8	1.7	2.6	3.8
22	1.0	4.2	10.1	2.0	20.2	5.2	7.1	5.9	3.7	1.7	2.2	3.0
23	1.0	3.8	9.6	2.0	20.2	5.0	6.8	5.4	3.7	1.8	2.0	2.6
24	.9	3.4	8.9	2.1	20.2	4.6	6.4	4.9	3.7	1.9	1.6	2.2
25	.9	3.0	7.8	2.4	19.4	5.2	6.0	4.4	3.8	2.2	1.5	2.1
26	.9	2.9	6.8	2.7	16.8	5.6	6.0	4.0	4.0	2.6	1.4	1.9
27	.9	2.6	6.0	3.0	13.2	5.9	7.0	4.2	4.0	2.6	1.3	1.8
28	.8	2.5	5.2	3.1	9.5	5.8	7.6	4.1	3.8	2.4	1.3	1.7
29	.8	2.7	4.5	3.1	.....	5.4	7.6	5.7	3.5	2.0	1.2	1.6
30	.8	2.9	4.0	3.3	.....	5.0	7.8	6.6	3.2	1.8	1.2	1.5
31	.8	.....	3.6	3.6	.....	4.8	.....	6.2	.....	2.0	1.1	.....

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Daily gage height, in feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1872–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1894.												
1	1.4	2.0	1.5	1.7	3.8	7.0	4.7	2.7	2.7	1.5	1.9	1.6
2	1.4	1.9	1.5	1.8	3.6	7.6	4.8	2.6	2.5	1.8	2.0	1.6
3	1.5	1.8	1.9	1.8	5.6	7.8	5.4	2.6	2.3	2.2	2.0	1.8
4	1.4	1.7	2.4	2.0	11.4	8.0	5.6	2.5	2.1	2.3	1.7	2.0
5	1.4	1.6	2.6	2.3	10.8	8.0	6.8	2.5	2.0	2.4	1.6	2.0
6	1.4	1.5	2.5	2.8	14.0	7.8	7.0	2.4	1.9	2.8	1.6	1.6
7	1.4	1.5	2.5	3.4	14.6	7.7	6.8	2.3	1.8	2.8	1.5	1.4
8	1.4	1.5	2.6	3.1	15.8	7.5	6.4	2.8	1.7	2.6	1.5	1.3
9	1.4	1.4	2.8	3.8	17.6	7.1	6.0	2.7	1.6	2.2	1.6	1.2
10	1.5	1.4	2.7	5.9	17.0	6.6	5.9	2.5	1.5	1.8	1.5	1.1
11	1.6	1.4	2.6	7.6	15.5	6.2	6.2	2.6	1.5	1.7	1.5	1.1
12	1.6	1.4	2.4	8.2	14.8	5.9	6.2	2.6	1.4	1.7	1.5	1.0
13	1.5	1.5	2.2	7.4	14.6	5.8	6.2	2.9	1.4	1.8	1.4	1.0
14	1.5	2.1	2.1	7.2	13.8	5.8	6.4	3.4	1.4	1.9	1.3	1.0
15	1.5	2.1	2.0	7.0	12.8	5.8	6.4	3.5	1.4	1.8	1.2	1.0
16	1.4	2.0	2.0	7.8	11.4	5.7	6.2	3.4	1.4	1.6	1.1	.9
17	1.3	1.9	2.4	7.1	9.8	5.8	5.7	3.2	1.4	1.5	1.1	.9
18	1.4	1.7	2.2	6.7	8.6	6.1	5.1	2.9	1.3	1.5	1.1	1.2
19	4.0	1.6	2.1	6.1	8.3	6.2	4.6	2.7	1.2	1.9	1.9	1.3
20	4.4	1.5	2.1	5.7	7.8	6.8	4.4	3.0	1.2	1.8	2.2	1.3
21	3.8	1.6	2.1	5.3	7.4	7.2	4.0	3.2	1.2	1.5	1.9	1.3
22	3.0	1.6	2.2	4.9	7.2	8.2	3.8	3.2	1.5	1.7	1.9	1.2
23	2.4	1.6	2.3	4.5	7.2	9.4	3.7	3.4	1.5	1.8	2.0	1.1
24	2.1	1.5	2.2	4.2	7.0	10.3	3.5	3.8	1.5	2.0	2.2	1.0
25	1.8	1.5	2.2	4.5	6.8	9.2	3.4	4.1	1.4	2.1	2.7	1.0
26	1.8	1.4	1.9	4.8	6.6	8.2	3.3	4.4	1.5	2.1	2.8	1.0
27	1.7	1.5	1.8	4.6	6.4	7.2	3.3	4.2	1.5	2.0	2.4	1.0
28	1.8	1.5	1.7	4.4	6.4	6.5	3.1	4.0	1.5	2.2	2.2	1.0
29	2.3	1.5	1.6	4.2	.....	5.9	3.0	3.6	1.5	2.1	1.9	.9
30	2.4	1.5	1.6	4.2	.....	5.4	2.8	3.2	1.5	2.1	1.8	.8
31	2.2	.....	1.7	4.0	.....	5.0	.....	3.0	.....	2.0	1.7	.....
1895.												
1	.8	— .1	.1	5.0	7.6	4.9	7.1	5.0	4.9	1.1	4.9	1.7
2	.8	— .1	.1	4.0	7.0	5.4	6.6	4.9	4.3	1.8	3.6	1.9
3	.7	.0	.1	3.2	6.6	7.8	6.1	4.7	3.8	2.3	2.7	1.9
4	.7	.1	.1	3.0	6.5	8.8	5.8	4.4	3.5	2.7	2.1	1.7
5	.6	.2	.1	2.2	6.4	10.8	5.4	4.2	3.2	2.9	1.9	1.7
6	.6	.3	.1	2.0	6.3	12.1	5.0	4.0	2.8	2.8	1.7	1.5
7	.8	.3	.0	2.2	6.4	12.6	5.1	4.2	2.7	3.4	1.6	1.4
8	.9	.2	.1	4.8	6.9	12.4	6.2	4.8	2.5	4.1	1.5	1.4
9	.9	.2	.1	6.0	6.6	11.0	7.8	5.1	2.5	4.9	1.3	1.4
10	.9	.2	.2	7.9	6.0	8.8	9.0	5.6	2.8	5.1	1.4	1.5
11	.9	.1	.4	11.7	5.5	7.8	9.0	6.2	2.9	5.1	1.5	1.8
12	.8	.1	.6	14.0	4.8	7.1	9.0	6.4	2.7	4.5	1.5	1.3
13	.7	.1	1.0	15.1	4.2	7.1	9.2	6.6	2.4	3.9	1.3	1.1
14	.7	.0	2.4	15.9	3.8	8.6	8.8	6.4	2.1	3.4	1.3	.9
15	.7	.0	5.4	16.4	3.5	9.6	7.7	6.3	1.9	3.1	1.3	.9
16	.7	.0	7.0	17.0	3.4	9.8	6.8	6.2	1.8	3.1	1.3	.9
17	.9	.1	7.0	17.4	3.3	9.8	6.3	6.2	1.7	2.5	1.3	1.2
18	1.1	.0	6.2	15.4	3.4	9.4	6.0	5.8	1.8	2.4	1.2	1.4
19	1.1	.0	5.1	12.2	3.5	8.8	5.8	5.4	1.9	2.3	1.2	1.1
20	1.0	.0	4.0	10.4	3.5	11.4	7.0	4.8	1.9	2.2	1.5	.9
21	.9	.0	3.0	10.2	3.8	13.8	8.0	4.6	1.9	2.0	2.7	.9
22	.8	.0	2.6	11.0	4.1	14.0	7.9	4.6	1.7	1.9	4.0	.8
23	.4	.0	2.0	10.7	4.4	14.1	7.2	4.6	1.5	1.7	4.3	.6
24	.0	.0	1.8	10.0	4.6	14.8	6.3	4.4	1.4	1.4	3.9	.6
25	.0	.0	1.5	9.5	4.9	14.9	5.7	3.8	1.4	1.3	3.5	.6
26	.0	.1	1.3	9.6	5.0	14.8	5.4	4.2	1.4	1.2	3.1	.5
27	— .1	.1	1.3	9.9	5.2	13.7	5.5	5.0	1.3	1.1	2.8	.4
28	.0	.1	1.9	9.5	5.0	11.8	5.5	6.2	1.3	1.1	2.8	.3
29	.0	.1	2.8	8.9	.....	9.8	5.6	6.4	1.2	1.4	2.5	.2
30	— .1	.1	4.0	8.4	.....	8.5	5.4	6.0	1.1	5.2	2.1	.1
31	— .1	.....	5.2	8.0	.....	7.6	.....	5.5	.....	6.1	1.8	.....

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Daily gage height, in feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1872–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1896.												
1	0.1	0.0	0.2	4.1	7.1	3.5	8.0	4.2	1.4	1.0	4.8	1.6
2	.1	.0	.4	3.8	12.2	3.3	12.2	3.9	1.3	1.0	3.9	1.2
3	.1	.0	.4	3.7	13.2	3.3	15.2	3.4	1.2	1.2	3.4	.9
4	.1	.0	.5	3.6	13.7	3.1	16.8	3.2	1.2	1.3	3.0	.6
5	.0	.1	.5	3.5	13.0	2.9	17.2	3.2	1.8	1.4	2.7	.6
6	.0	.1	.4	3.5	12.3	3.0	17.6	3.0	2.8	1.6	2.6	.5
7	.0	.2	.4	3.3	11.9	3.3	18.4	3.0	3.0	1.7	2.3	.4
8	.0	.2	.4	3.2	11.1	3.7	19.2	3.1	2.8	1.8	2.4	.2
9	.0	.2	.4	3.3	12.1	3.3	19.8	3.0	2.7	2.0	2.5	.2
10	.0	.3	.4	2.9	12.6	3.1	18.7	2.8	2.4	2.7	2.3	.2
11	.0	.3	.4	2.8	12.1	3.0	14.5	2.6	2.4	4.9	1.8	.8
12	.0	.3	.4	2.6	11.3	3.0	9.4	2.4	2.7	9.2	1.6	.6
13	— .1	.2	.3	2.3	11.1	2.9	7.0	2.0	3.9	11.4	1.4	.7
14	— .1	.2	.3	2.1	11.7	2.9	5.8	1.8	3.9	11.6	1.2	.6
15	.0	.3	.5	2.0	11.8	3.1	5.0	1.6	3.2	10.3	1.2	.4
16	.0	.5	.5	1.9	11.5	4.9	4.6	1.4	2.7	8.6	1.2	.4
17	.0	.6	.5	1.7	11.3	7.5	4.2	1.3	2.1	8.0	1.2	.4
18	.0	.6	.6	1.6	10.9	7.2	4.0	1.2	1.8	7.9	1.2	.4
19	.0	.6	.5	1.6	9.9	8.7	3.6	1.1	1.5	8.1	1.1	.2
20	.0	.4	.7	1.5	8.7	11.7	3.4	1.1	1.4	8.7	1.0	.2
21	.0	.4	.5	1.4	7.3	12.7	3.2	1.1	1.3	8.0	.9	.1
22	.0	.4	.6	1.5	6.3	12.7	3.1	1.0	1.2	6.6	.8	.2
23	.0	.4	.6	1.8	5.5	11.7	3.1	1.0	1.4	5.2	.7	.1
24	.0	.2	.6	2.4	4.8	10.1	3.0	1.0	1.7	4.5	.7	.1
25	.0	.2	1.1	2.9	4.4	8.9	2.8	1.1	1.6	4.5	.6	.0
26	.0	.2	4.0	4.0	3.9	7.9	2.8	1.4	1.6	5.6	.6	.0
27	— .1	.2	7.2	5.1	3.7	7.3	3.4	1.8	1.4	5.4	.6	.0
28	— .1	.3	6.4	5.7	3.5	6.6	4.2	2.1	1.7	5.2	.7	.2
29	— .1	.3	4.7	5.7	3.4	6.1	4.0	2.2	1.4	6.8	.7	.4
30	— .1	.3	4.3	5.1	.....	5.8	4.0	2.0	1.1	7.1	.8	.6
31	.1	.....	4.2	4.5	.....	6.5	.....	1.6	.....	6.0	1.0	.....
1897.												
1	.4	.1	5.5	1.2	2.8	16.8	8.8	4.2	2.4	3.3	3.5	.7
2	.4	.1	6.7	1.1	3.8	17.1	10.4	4.1	2.3	3.0	2.9	.7
3	.4	.1	8.2	1.0	4.2	15.4	10.2	4.0	2.3	2.6	2.4	.5
4	.6	.2	8.9	1.2	6.1	11.2	13.8	4.1	2.4	2.3	2.0	.4
5	.7	.2	8.8	1.6	7.9	9.0	16.3	4.9	2.3	2.1	1.9	.4
6	.8	.3	7.3	1.7	8.4	9.6	17.2	6.0	2.3	1.9	1.8	.4
7	.9	.3	5.8	1.7	8.8	13.0	17.5	6.1	2.3	1.6	1.9	.3
8	.9	.2	4.7	1.7	8.7	14.1	17.2	5.7	2.2	1.7	1.7	.2
9	.7	.2	3.8	1.7	9.1	14.6	17.8	5.1	2.2	1.8	1.8	.1
10	.6	.6	3.4	1.7	9.6	15.8	18.1	4.8	2.3	1.7	2.0	.1
11	.7	1.5	3.0	1.6	10.5	17.1	17.7	4.7	2.3	1.9	2.1	.1
12	.5	2.4	2.8	1.5	10.8	19.8	16.3	4.9	2.1	2.3	2.8	.1
13	.2	3.8	2.7	1.5	10.2	21.0	13.8	6.9	2.4	2.1	2.9	.1
14	.0	2.6	2.7	1.5	8.8	22.3	11.5	8.3	3.1	2.1	2.6	.0
15	.0	3.6	3.4	2.0	8.1	22.8	9.9	11.1	3.0	2.3	2.1	.0
16	.0	4.3	3.9	2.5	7.8	24.2	9.0	13.1	2.5	2.3	1.9	— .1
17	.0	4.1	3.6	3.3	7.8	25.1	8.3	13.5	2.3	2.1	1.5	— .1
18	.0	3.5	3.2	5.4	7.6	26.3	7.9	13.4	1.9	1.9	1.3	— .2
19	.2	2.9	2.8	6.2	7.1	31.6	7.7	12.1	1.7	2.5	1.0	— .2
20	.2	2.6	2.5	6.3	6.5	30.6	7.4	9.8	1.6	3.8	1.1	— .2
21	.1	2.1	2.4	6.0	6.0	28.6	6.9	7.3	1.5	4.3	1.3	— .2
22	.2	1.8	2.7	6.4	6.0	27.2	6.5	6.0	1.4	3.9	1.3	— .3
23	.2	1.4	2.8	6.4	6.3	25.3	5.9	5.0	1.5	3.9	1.4	— .3
24	.2	1.2	2.6	6.1	8.7	24.2	5.5	4.5	2.2	3.8	1.3	— .3
25	.2	1.0	2.4	5.8	11.8	23.0	5.1	4.0	2.4	3.6	1.1	— .3
26	.2	.9	2.2	5.4	13.9	21.8	4.7	3.7	2.6	3.7	1.3	— .3
27	.2	.8	2.0	5.0	15.0	20.6	4.5	3.5	2.7	4.7	1.4	— .3
28	.1	1.6	1.6	4.4	16.2	19.0	4.3	3.3	3.2	6.7	1.3	— .3
29	.1	5.4	1.6	3.9	.....	14.2	4.1	2.9	3.2	7.3	1.1	— .3
30	.1	5.4	1.4	3.4	.....	11.0	4.2	2.6	3.1	6.0	.9	— .3
31	.1	.....	1.3	3.0	.....	9.2	.....	2.5	.....	4.5	.9	.....

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Daily gage height, in feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1872–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1898.												
1	−0.3	0.1	−0.2	3.0	9.8	2.3	6.3	5.2	2.5	0.9	3.6	1.9
2	− .3	.0	.0	2.6	7.9	2.3	9.3	5.3	2.1	.9	4.9	1.8
3	− .3	.0	.2	2.5	6.5	2.1	11.1	5.1	1.7	.9	5.4	1.6
4	− .3	.0	.4	2.2	5.7	2.0	11.5	4.6	1.5	.7	5.2	1.6
5	− .3	− .1	1.5	1.9	4.9	1.9	11.1	4.1	1.5	.7	4.6	4.7
6	− .3	− .1	1.7	1.9	4.5	1.7	11.0	3.8	1.3	.7	3.6	10.0
7	− .4	.0	1.8	1.8	4.1	1.7	10.3	3.4	1.1	.6	3.3	12.0
8	− .4	.0	2.3	1.6	3.7	1.7	9.8	3.3	1.0	.6	6.4	12.6
9	− .4	.0	2.2	1.5	3.4	1.9	9.4	3.1	.9	.6	8.4	11.4
10	− .4	.1	2.0	1.4	3.1	1.9	8.5	2.7	.7	.6	8.8	8.7
11	− .5	.2	1.8	1.6	3.1	1.8	7.8	2.6	.6	.6	8.4	6.8
12	− .4	.1	1.4	2.1	2.9	1.7	7.5	2.6	.5	.8	7.5	5.7
13	− .4	.1	1.4	3.3	2.7	1.9	7.5	2.5	.5	1.0	6.8	4.8
14	− .4	.0	1.0	4.5	2.7	1.9	7.7	2.7	.4	1.3	7.8	4.0
15	− .4	.0	1.0	11.1	2.5	2.2	7.5	2.7	.5	1.4	9.0	3.5
16	− .4	.0	.9	13.4	2.4	4.3	7.3	2.5	.6	1.3	9.8	3.0
17	− .3	.1	.9	12.4	2.3	4.5	7.1	2.3	.6	1.2	9.4	2.6
18	− .2	.1	1.1	10.2	2.1	4.1	7.0	2.1	.5	1.2	7.8	2.2
19	.0	.0	1.5	10.6	2.1	5.1	7.7	2.0	.5	1.5	6.3	2.1
20	.0	.0	2.3	13.4	2.1	4.8	9.5	2.0	.6	2.1	5.0	2.0
21	.1	− .1	5.0	11.9	2.0	4.6	9.5	1.9	.6	2.7	4.2	1.8
22	.1	− .2	6.4	11.6	1.9	4.7	8.7	1.9	1.5	2.3	3.6	1.8
23	.1	− .2	7.2	12.7	1.9	4.5	8.1	1.8	2.3	1.9	3.6	1.7
24	.2	− .2	7.8	12.6	1.8	3.9	7.3	1.7	2.8	1.7	3.2	1.6
25	.3	− .2	8.7	12.1	1.8	3.9	6.7	1.7	3.7	1.5	3.0	2.1
26	.2	− .2	7.8	13.0	1.9	3.6	6.7	1.5	3.1	1.5	2.8	2.6
27	.2	− .2	6.5	13.8	2.1	3.2	6.3	1.5	2.6	1.7	2.4	2.8
28	.2	− .2	5.6	13.8	2.3	3.2	6.1	1.5	2.1	2.4	2.1	3.8
29	.2	− .2	4.6	13.8	.....	4.7	5.8	2.0	1.6	2.5	1.9	3.8
30	.2	− .2	4.0	13.4	.....	5.7	5.8	2.7	1.1	3.3	1.7	3.2
31	.1	.....	3.4	12.2	.....	5.9	.....	2.9	.....	3.7	1.8	.....
1899.												
1	2.4	3.1	3.3	3.3	4.8	14.9	14.3	6.6	2.3	1.6	2.4	.1
2	2.0	2.8	3.1	3.2	5.0	14.4	14.4	6.0	2.3	1.6	2.4	.2
3	1.7	2.4	3.0	3.0	5.2	14.3	14.5	5.6	2.3	1.4	2.6	.2
4	1.5	2.3	3.0	2.9	7.1	13.6	14.2	5.2	2.2	1.4	2.2	.4
5	1.4	2.2	3.2	3.3	12.8	12.4	12.9	4.8	2.2	1.4	1.8	.6
6	1.4	2.0	3.3	6.8	15.9	12.1	11.2	4.6	2.3	1.2	1.4	.8
7	3.9	2.0	3.3	11.0	17.8	12.8	10.7	4.3	2.5	1.1	1.2	1.0
8	8.9	1.9	3.6	13.6	18.3	13.8	12.0	4.6	2.4	1.0	1.0	.9
9	9.6	1.9	3.9	14.1	18.6	14.6	13.0	5.5	2.2	.8	1.0	.8
10	8.2	2.0	3.9	13.6	19.0	15.2	13.4	6.2	2.2	.8	.9	.6
11	6.6	2.2	3.7	13.8	19.6	15.3	13.4	6.6	1.9	1.0	.8	.5
12	5.4	2.3	3.4	13.0	20.0	13.9	12.6	7.1	1.7	1.0	.8	.4
13	4.8	2.4	3.2	11.0	20.0	11.8	11.4	7.4	1.8	.9	.8	.3
14	4.2	2.5	3.0	9.2	20.4	11.7	10.2	7.1	1.9	.8	.8	.3
15	3.6	2.9	2.8	8.0	18.9	17.4	9.2	6.6	2.5	.8	.6	.3
16	3.4	2.8	2.4	7.2	14.4	21.0	8.3	6.3	3.0	.7	.6	.3
17	3.2	2.6	2.2	6.6	10.2	21.8	7.6	6.3	3.6	.7	.6	.3
18	2.9	2.4	2.2	6.4	8.8	22.6	7.2	6.1	3.6	.6	.8	.4
19	2.8	2.4	2.0	6.2	8.4	24.6	6.8	5.9	3.6	.5	.9	.4
20	2.9	2.4	2.4	6.0	8.7	25.1	6.4	5.2	3.8	.5	.8	.2
21	3.6	2.6	3.4	5.6	9.4	24.8	6.0	4.6	3.3	.5	.8	.2
22	4.7	3.0	4.3	5.4	9.6	24.5	5.8	4.4	2.8	.7	.7	.2
23	5.9	4.0	4.8	4.2	9.4	24.1	6.1	3.9	2.4	1.1	.6	.1
24	5.9	4.5	4.4	4.6	8.8	23.7	6.6	3.6	2.2	1.3	.5	.1
25	5.2	4.9	4.0	6.2	8.4	23.5	8.6	3.4	1.8	1.5	.4	.0
26	4.8	4.8	3.8	6.7	10.0	23.2	9.6	3.1	1.6	1.6	.4	.0
27	4.7	4.6	3.6	6.5	13.8	22.8	9.2	3.0	1.4	2.1	.3	.0
28	4.7	4.2	3.6	6.5	16.6	22.2	8.9	2.8	1.3	2.1	.2	.2
29	4.4	3.8	3.6	5.8	.....	20.2	8.2	2.7	1.3	1.8	.2	.2
30	3.8	3.3	3.5	5.2	.....	17.1	7.3	2.4	1.2	1.8	.2	.1
31	3.4	.....	3.4	4.8	.....	14.5	.....	2.4	.....	2.1	.1	.....

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Daily gage height, in feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1872–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1900.												
1	0.1	—0.1	0.7	3.5	2.8	8.0	7.2	6.4	2.2	9.2	5.4	1.1
2	.0	— .1	.6	3.0	2.6	8.3	6.6	6.1	2.4	8.8	4.9	1.0
3	.0	— .1	.5	2.5	2.4	7.4	6.0	5.4	2.8	8.3	4.2	1.0
4	.0	— .1	.5	2.0	2.1	7.8	5.8	4.9	3.2	8.1	3.6	.8
5	.0	— .1	.3	1.5	2.4	8.4	5.8	4.2	3.6	7.0	3.0	.6
6	.0	.0	.4	1.1	2.8	9.0	5.8	4.0	4.8	5.8	2.5	.6
7	.0	.0	.4	1.0	3.0	10.0	6.2	3.8	5.4	5.0	2.1	.6
8	.0	.0	.4	1.0	3.0	10.8	6.4	3.6	5.8	4.3	1.8	.6
9	.0	.1	.3	1.0	4.2	11.0	6.4	3.6	5.9	4.0	1.4	.5
10	— .1	.1	.4	1.2	5.6	11.4	6.0	3.4	6.2	3.6	1.2	.4
11	.0	.1	2.3	2.1	6.0	11.9	9.2	3.2	5.7	2.8	1.0	.3
12	.0	.2	3.9	4.9	7.0	12.0	11.0	3.0	4.9	3.0	1.0	.2
13	.1	.2	4.8	5.9	8.8	11.7	11.0	3.0	4.6	3.0	.8	.1
14	.2	.2	6.0	7.2	11.4	10.8	10.4	2.7	4.2	2.8	.7	.1
15	.3	.2	6.6	7.7	12.8	9.4	8.8	2.6	5.1	2.6	.6	.1
16	.4	.1	6.4	7.5	14.0	8.2	7.8	2.4	4.9	2.2	.6	.2
17	.4	.1	5.8	6.9	14.6	7.4	11.2	2.3	5.2	2.1	.6	.4
18	.4	.1	5.0	6.4	14.4	6.7	18.0	2.2	5.4	2.0	.6	.6
19	.2	.0	4.8	6.3	13.6	6.4	19.0	2.1	5.4	2.1	.9	1.3
20	.1	.0	5.5	7.3	10.6	7.6	19.2	2.0	5.7	2.1	.8	1.8
21	.1	.0	4.8	8.5	8.5	8.9	17.8	2.0	6.4	2.0	.7	2.2
22	.1	.1	4.5	9.2	7.0	9.2	15.0	1.9	6.7	1.8	.7	2.3
23	.1	.1	4.6	8.6	7.0	9.6	13.7	2.1	7.4	1.6	.8	2.2
24	.0	.0	6.0	7.8	7.2	11.0	12.9	2.6	9.0	1.6	.8	1.7
25	.0	.2	6.3	6.8	7.4	11.8	11.6	2.4	9.2	1.5	.6	1.4
26	.0	.2	6.7	6.0	7.4	11.8	10.4	2.1	9.4	1.5	.6	1.0
27	.0	.4	6.4	5.2	6.4	10.8	9.6	1.8	11.6	2.6	.5	.7
28	.0	.6	5.6	4.5	7.2	9.6	8.4	1.8	12.8	3.0	.6	.7
29	.0	.8	5.1	4.0	.....	8.8	7.4	1.7	12.0	2.9	.8	.7
30	— .1	.8	4.6	3.6	.....	8.2	6.8	2.0	10.4	3.1	1.2	.8
31	— .1	.....	4.2	3.1	.....	7.9	.....	2.1	.....	4.8	1.4	.....
1901.												
1	.7	2.3	10.2	3.6	5.5	2.4	13.2	10.1	9.9	4.8	.9	7.2
2	.6	1.8	9.0	3.8	5.6	2.4	13.0	9.0	9.3	4.2	.9	7.0
3	.6	1.4	6.9	4.0	6.7	2.6	13.0	7.9	8.7	3.7	.9	6.9
4	.6	1.2	5.0	4.2	10.0	2.6	13.4	6.9	7.9	3.6	.9	6.7
5	.4	1.0	4.2	4.1	10.7	2.6	14.4	6.1	6.9	3.7	.9	6.6
6	.3	1.0	4.0	4.0	10.4	2.6	15.1	5.6	6.1	3.7	1.1	6.7
7	.3	1.3	4.0	3.6	10.1	3.0	15.4	5.1	5.4	3.5	1.3	6.3
8	.8	1.5	4.5	3.4	9.5	3.2	15.2	4.5	4.9	3.3	.9	5.3
9	.8	1.8	5.6	3.0	8.8	3.6	14.2	5.0	5.0	3.1	.9	4.6
10	.5	2.0	6.0	3.0	8.6	7.8	12.2	4.2	5.2	2.9	4.5	4.1
11	.8	2.0	5.8	4.8	7.8	11.6	9.8	4.0	5.1	2.9	6.9	3.7
12	2.4	1.6	5.0	10.9	7.1	12.0	8.1	4.0	5.1	3.3	6.2	3.3
13	3.8	1.4	4.4	14.0	6.6	11.6	7.1	3.8	5.7	3.7	5.2	3.3
14	3.1	1.2	3.7	15.2	6.0	10.6	6.6	3.7	5.1	3.3	4.1	3.0
15	2.8	1.0	3.2	15.9	5.8	9.0	6.4	3.6	4.5	2.8	4.0	3.9
16	2.2	.9	3.0	16.2	5.8	7.5	7.0	3.5	4.2	2.4	7.1	5.7
17	1.5	.8	2.6	16.2	5.4	6.4	7.3	3.3	4.1	2.1	13.3	6.5
18	1.2	.7	2.4	15.4	5.0	5.5	7.9	3.2	4.7	2.0	15.2	8.0
19	.8	.6	2.2	13.0	4.6	5.0	10.0	3.1	5.7	1.9	16.9	7.7
20	.7	.7	2.0	9.3	4.0	4.6	13.3	3.1	6.2	1.9	18.0	7.9
21	.6	1.2	2.2	7.2	4.0	4.6	15.2	4.1	6.1	1.9	18.5	7.7
22	.7	1.4	2.8	6.0	3.7	4.6	15.9	6.5	5.7	1.8	18.9	6.9
23	.8	1.2	2.8	5.5	3.4	4.4	16.3	9.7	5.3	1.9	18.2	6.0
24	1.0	1.1	3.2	5.4	3.2	4.0	16.1	12.3	5.2	1.9	17.3	5.3
25	1.0	1.4	3.6	6.5	3.2	4.1	16.0	13.7	6.1	1.8	16.1	4.5
26	.8	3.3	3.9	6.4	2.9	4.6	15.6	14.7	5.9	1.8	14.7	3.9
27	1.4	5.0	4.0	6.4	2.8	6.2	14.8	15.7	5.2	1.5	13.0	3.5
28	3.5	6.7	4.0	6.0	2.6	8.6	13.4	16.1	5.8	1.3	10.9	3.3
29	4.4	9.6	3.6	5.6	.....	11.4	12.0	16.1	6.1	1.1	9.1	3.5
30	3.9	10.4	3.4	5.4	.....	12.6	11.0	14.5	5.5	1.0	8.3	3.7
31	3.2	.....	3.2	5.4	.....	13.5	.....	12.1	.....	.9	7.7	.....

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Daily gage height, in feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1872–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1902.												
1	3.3	1.0	0.8	17.1	15.6	13.2	17.6	3.7	2.3	1.7	1.1	0.2
2	3.1	1.0	.8	17.8	16.1	14.9	17.2	3.7	2.4	2.5	.9	.3
3	2.9	.9	.9	18.6	16.5	15.6	16.8	4.2	2.3	4.7	.9	.3
4	2.9	.9	.9	18.8	16.4	16.6	17.6	6.4	2.0	6.1	.7	.5
5	2.9	.9	.9	20.6	16.2	18.1	17.2	6.8	1.7	5.5	.6	.4
6	2.9	.9	.9	20.8	15.7	19.4	14.5	6.2	1.6	4.7	.6	.1
7	2.7	.9	.9	20.3	14.8	20.4	11.6	5.1	1.6	4.1	.6	.1
8	2.7	.9	.9	17.4	13.7	20.9	10.3	4.3	1.6	3.3	.7	.1
9	2.6	.9	1.0	12.4	11.4	20.9	9.8	3.9	1.5	2.7	.7	.1
10	2.5	.9	1.1	8.9	8.8	20.2	9.2	3.7	1.3	2.1	.7	.1
11	2.2	.9	1.3	8.2	7.4	18.8	8.6	3.7	1.3	1.9	.5	.1
12	2.1	.9	1.4	6.2	6.5	15.9	8.0	3.3	1.3	1.7	.5	.1
13	1.9	.9	1.8	5.5	6.0	13.6	7.6	3.1	1.3	1.5	.5	.1
14	1.9	.9	2.6	5.1	5.6	11.2	7.0	2.9	1.3	1.4	.7	.1
15	1.9	.9	7.8	4.8	5.4	9.8	6.6	2.7	1.3	1.3	.7	.1
16	2.1	.8	12.4	4.4	5.4	9.1	6.4	2.6	1.3	1.5	.7	.2
17	2.2	.8	15.0	4.1	5.3	9.6	6.0	2.7	1.2	2.1	.6	.3
18	2.2	.8	15.8	3.9	5.0	9.9	5.8	2.7	1.1	2.1	.5	.3
19	2.2	.8	16.0	3.9	4.8	10.6	5.6	2.6	1.1	1.8	.3	.3
20	2.1	.8	16.0	4.4	4.6	10.8	5.3	2.6	1.1	1.5	.2	.3
21	1.9	.8	15.1	4.7	4.5	10.5	5.2	2.5	1.5	1.3	.2	.2
22	1.8	.7	12.0	5.7	4.6	9.6	5.0	2.5	1.9	1.0	.2	.1
23	1.7	.7	8.3	6.0	4.8	9.4	4.9	2.3	2.1	.9	.2	.1
24	1.5	.7	6.8	6.2	5.1	8.2	4.8	2.3	2.1	.8	.2	.0
25	1.4	.8	5.6	6.0	5.8	7.2	4.6	2.4	1.9	.8	.2	.2
26	1.4	.8	5.7	6.1	7.0	7.0	4.4	2.4	1.7	.8	.2	.6
27	1.3	.8	6.3	7.6	7.7	6.9	4.2	2.4	1.7	.7	.2	.8
28	1.2	.8	8.2	9.4	9.8	8.4	4.2	2.3	1.5	.7	.1	.9
29	1.2	.8	11.6	9.5	.....	19.8	3.9	2.2	1.7	.6	.2	1.4
30	1.2	.8	14.8	11.8	.....	19.2	3.8	1.9	1.7	.7	.3	1.8
31	1.1	.....	16.2	14.2	.....	18.7	.....	2.1	.....	.7	.2	.....
1903.												
1	1.6	— .3	4.9	3.8	4.0	14.4	12.8	6.6	5.4	2.8	.7	.2
2	1.7	— .3	5.0	4.1	3.9	16.1	12.6	6.5	6.6	2.8	.7	.1
3	1.6	— .3	5.4	5.5	4.6	16.9	12.6	6.2	7.0	2.5	.9	.0
4	1.6	— .4	5.7	5.6	8.6	17.6	12.1	5.8	8.1	2.4	1.2	.0
5	1.6	— .3	6.4	5.5	10.8	18.2	11.2	5.4	10.2	2.2	1.1	.0
6	1.6	— .2	7.3	5.6	12.5	18.8	10.1	5.0	9.8	2.0	1.4	.0
7	1.2	— .2	6.8	5.8	14.2	18.4	9.5	4.6	9.2	2.0	2.4	.0
8	1.0	— .2	6.2	5.6	15.9	18.0	9.7	4.5	8.6	2.1	2.4	.0
9	.8	— .2	5.7	6.0	16.6	17.0	11.1	4.5	8.2	2.2	2.6	— .1
10	.6	— .2	5.1	5.7	15.9	16.6	13.2	4.2	8.4	2.1	2.4	— .1
11	.8	— .2	4.6	5.7	16.3	16.7	14.8	4.0	7.9	2.1	1.8	— .1
12	.8	.0	4.0	5.9	16.6	16.8	15.6	3.9	7.4	2.2	2.0	— .1
13	1.2	.1	3.4	5.8	15.8	16.8	16.6	3.8	6.9	2.7	1.8	— .2
14	.8	.1	3.0	5.7	15.0	16.6	18.2	4.3	6.3	2.7	1.4	— .2
15	1.5	.1	3.0	5.6	14.9	15.7	17.9	6.2	5.8	2.8	1.2	— .2
16	1.2	.1	6.1	5.9	14.8	14.2	17.2	5.9	5.1	3.3	1.2	— .2
17	1.1	.1	6.2	5.6	16.8	12.7	16.2	4.7	4.6	3.5	1.8	— .2
18	1.2	.1	5.6	5.0	17.5	11.2	15.4	4.4	4.3	3.5	2.2	— .2
19	1.4	.0	5.6	4.6	17.5	9.8	14.8	4.0	3.6	3.4	2.4	— .2
20	1.3	— .2	6.2	4.4	17.4	8.7	14.2	3.5	3.2	3.2	2.1	— .2
21	1.2	— .2	6.8	4.0	17.3	8.0	12.8	3.2	2.8	2.8	1.8	— .2
22	1.0	— .2	7.4	3.6	17.7	7.8	11.6	3.0	2.6	2.4	1.7	— .2
23	.8	— .2	7.4	3.4	17.6	7.7	10.5	2.9	2.5	2.0	1.7	— .2
24	.4	— .1	7.6	3.2	16.0	7.8	9.8	2.6	2.6	1.9	1.5	— .2
25	.4	1.0	7.6	3.0	12.9	9.0	9.4	2.5	2.5	1.9	1.2	— .2
26	.2	2.4	6.6	2.8	9.6	11.5	8.6	2.3	2.8	1.6	1.0	— .2
27	.2	2.8	5.8	3.0	8.0	13.4	7.9	2.2	2.6	1.3	.9	— .2
28	.0	3.3	5.0	4.0	9.7	14.6	7.4	2.2	2.5	1.2	.6	— .2
29	— .1	4.2	4.6	4.4	.....	15.2	6.9	1.9	2.5	1.0	.5	— .2
30	— .1	4.5	4.3	4.2	.....	15.0	6.6	2.0	2.5	.9	.4	— .3
31	— .2	.....	4.0	4.2	.....	13.5	.....	3.0	.....	.8	.4	.....

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Daily gage height, in feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1872–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1904.												
1	−0.4	−0.4	0.1	1.9	3.2	5.2	11.2	2.6	2.6	0.9	0.5	0.6
2	− .4	− .4	.1	2.0	2.6	5.8	10.1	2.9	3.4	1.0	.6	.6
3	− .4	− .2	.1	1.8	2.2	5.8	8.5	3.6	4.0	1.2	.8	.5
4	− .4	.0	.0	1.5	2.0	5.5	7.4	4.6	3.6	1.5	.7	.5
5	− .5	.4	.0	1.0	1.8	5.2	6.4	4.4	3.2	1.7	.7	.5
6	− .5	.3	− .1	.8	1.6	5.0	5.7	4.0	2.8	2.1	.8	.3
7	− .5	.2	− .2	.7	1.4	4.8	5.4	3.8	2.4	2.1	1.0	.3
8	− .2	.1	− .2	.6	1.3	5.8	5.2	3.5	3.3	2.4	1.0	.3
9	.0	.2	− .3	.5	1.5	6.2	5.7	3.4	3.0	2.2	1.3	.3
10	− .1	.2	− .3	.5	2.0	6.9	5.8	3.5	2.5	1.6	1.8	.3
11	− .2	.0	− .3	.4	3.2	8.0	5.8	3.7	2.2	1.4	2.2	.4
12	− .3	− .1	− .3	.3	3.8	8.4	5.4	4.0	1.9	1.2	2.6	.5
13	− .2	− .1	− .2	.4	3.8	8.2	5.0	4.3	1.6	1.2	2.5	.4
14	− .1	− .1	− .2	.4	3.6	8.0	4.6	4.6	1.6	1.3	2.2	.4
15	− .1	− .1	− .2	.5	3.2	8.2	4.2	4.2	1.2	1.3	2.1	.5
16	.0	− .1	− .2	.5	3.0	8.1	4.0	3.9	1.1	1.4	2.2	.4
17	.2	.0	− .2	.6	2.7	8.0	3.7	3.4	1.0	1.5	2.0	.4
18	.0	1.2	− .2	.7	2.5	7.2	3.4	3.0	.9	1.5	1.7	.4
19	− .1	.7	− .1	1.2	2.0	6.2	3.2	3.0	.9	1.4	1.8	.4
20	− .2	.7	.6	1.4	1.9	5.8	3.0	2.8	.8	1.0	2.0	.3
21	− .3	2.1	2.6	1.7	1.9	5.4	3.0	2.4	.7	1.0	1.7	.4
22	− .3	3.5	1.5	2.6	1.8	7.9	3.0	2.2	.7	.9	1.5	.4
23	− .3	2.9	1.7	4.4	2.0	9.5	3.0	2.0	.6	.9	1.1	.4
24	− .4	2.5	2.6	5.0	3.0	11.8	2.8	1.8	.5	.8	1.0	.3
25	− .4	1.7	2.9	6.8	4.1	14.0	2.7	1.5	.5	.6	1.0	.3
26	− .4	1.1	2.6	8.0	5.2	15.0	2.6	1.4	.8	.6	.8	.2
27	− .4	.8	2.4	6.8	5.4	17.2	2.5	1.4	.7	.5	.7	.2
28	− .4	.5	2.0	5.8	5.4	17.0	2.5	1.2	.7	.6	.8	.2
29	− .4	.5	1.8	5.0	5.0	15.8	2.4	1.2	1.0	.5	1.0	.2
30	− .4	.2	1.7	4.4	.....	14.5	2.3	1.3	1.0	.5	1.0	.2
31	− .4	.....	1.8	3.6	.....	12.9	.....	1.3	.....	.5	.8	.....
1905.												
1	.2	− .5	.0	7.2	2.3	9.2	3.7	5.8	4.4	6.4	2.2	2.6
2	.2	− .5	.1	6.0	2.2	7.9	3.6	6.6	4.3	7.7	2.0	2.6
3	.1	− .5	.1	4.8	2.2	6.9	3.5	6.6	4.2	7.4	1.8	3.8
4	.0	− .4	.1	4.0	2.3	6.4	3.5	6.2	3.7	6.0	1.8	3.6
5	.0	− .3	.2	3.4	2.7	5.8	3.5	5.4	3.2	4.8	1.8	3.0
6	.0	− .2	.8	2.8	3.5	5.2	3.4	4.8	2.8	3.8	1.8	2.4
7	.0	− .2	1.8	2.6	5.1	4.9	3.2	4.7	2.6	3.4	1.8	2.0
8	.0	− .2	2.2	3.0	6.4	4.8	3.0	4.8	2.2	3.2	1.5	1.8
9	.0	− .2	2.8	2.7	11.0	6.0	3.0	4.6	2.1	3.2	1.4	1.6
10	.0	− .2	3.2	2.8	14.0	9.6	3.2	4.6	2.0	3.0	1.4	1.5
11	− .1	− .2	3.4	3.2	15.0	10.8	3.4	5.2	1.8	3.6	1.6	1.6
12	− .1	− .2	3.2	5.2	16.7	11.8	4.2	5.8	1.7	4.2	1.8	1.6
13	− .2	− .2	2.7	7.8	16.7	12.8	4.2	5.7	1.7	4.5	2.6	1.4
14	− .2	− .2	2.2	8.3	16.2	12.6	4.4	5.2	1.4	4.4	3.8	1.2
15	− .2	− .1	1.5	10.6	14.1	11.6	4.6	4.8	1.3	5.0	4.8	1.0
16	− .2	− .1	1.2	11.6	12.4	10.2	4.9	4.2	1.4	7.2	5.7	1.0
17	− .3	− .1	1.0	11.4	11.0	8.4	5.2	4.6	1.8	8.1	6.2	.9
18	− .3	− .1	.9	10.4	9.8	7.0	5.0	5.4	1.8	7.3	5.8	.8
19	− .3	− .2	.8	8.4	9.0	6.2	4.6	7.4	1.8	6.2	5.2	.8
20	− .3	− .2	.7	6.6	9.2	5.6	4.1	8.8	1.7	5.3	4.8	.8
21	− .4	− .2	.6	5.6	13.0	5.8	3.8	8.8	1.6	4.2	4.2	.8
22	− .4	− .1	.5	4.8	15.0	6.5	3.4	7.8	2.4	3.4	3.9	.6
23	− .4	.0	.4	4.4	15.5	6.8	3.2	7.2	3.8	3.0	3.4	.5
24	− .4	.0	.4	3.9	15.7	6.8	3.2	9.2	4.4	3.0	3.2	.4
25	− .4	.0	.6	3.4	15.5	6.5	3.1	10.0	4.8	3.0	2.8	.3
26	− .4	.0	1.0	3.1	14.6	5.9	3.1	9.6	4.4	3.1	2.6	.3
27	− .4	− .1	1.5	2.8	13.1	5.4	3.2	9.0	4.2	3.0	3.4	.2
28	− .5	− .1	4.2	2.6	10.8	5.0	3.7	7.8	4.8	2.9	4.0	.2
29	− .5	− .1	5.6	2.4	.....	4.8	4.4	6.6	5.2	2.9	3.7	.1
30	− .5	− .1	7.2	2.3	.....	4.4	5.3	5.6	6.0	2.8	3.2	.0
31	− .5	.....	8.5	2.4	.....	4.0	.....	4.8	.....	2.5	2.9	.....

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Daily gage height, in feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1872–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1906.												
1	0.1	1.8	0.3	5.6	7.9	4.0	11.5	3.6	2.4	3.4	5.0	4.6
2	.0	1.5	.3	5.1	7.6	3.9	11.8	3.5	2.8	3.0	5.0	6.5
3	.1	1.4	.4	5.0	7.2	4.8	11.6	3.4	3.0	2.6	5.5	7.6
4	.1	1.2	.9	5.8	6.6	6.8	10.2	3.3	2.9	2.5	6.1	7.5
5	.3	1.0	1.2	7.2	6.2	7.2	8.8	3.3	2.8	2.4	6.2	6.6
6	.3	.8	3.3	8.7	6.0	8.0	7.6	3.4	3.0	2.2	5.9	5.8
7	.3	.6	6.2	9.4	5.6	8.0	6.8	3.4	3.0	1.9	5.2	5.3
8	.2	.6	6.6	10.0	5.2	7.2	6.1	3.5	3.0	1.8	5.2	5.4
9	.1	.6	6.2	9.4	4.8	6.6	6.0	3.8	2.4	1.8	4.8	5.8
10	.4	.5	5.9	8.8	4.4	6.0	5.8	4.2	2.3	1.9	4.6	6.6
11	1.0	.4	6.2	7.8	4.0	5.4	5.9	5.0	2.2	1.9	4.2	6.8
12	1.8	.4	7.0	7.4	3.8	4.8	6.0	5.6	2.0	2.4	4.0	6.6
13	1.6	.4	7.0	7.5	3.6	4.6	6.4	5.4	1.8	3.3	3.6	6.8
14	1.3	.4	6.8	7.0	3.4	4.7	6.8	4.6	1.8	3.5	3.6	6.4
15	1.4	.3	6.6	6.5	3.2	7.8	6.6	3.9	1.8	3.4	3.8	5.5
16	1.9	.3	7.6	6.0	3.0	10.2	6.3	3.6	2.1	5.2	3.4	4.7
17	2.0	.2	7.0	6.0	3.0	9.3	6.2	3.1	3.2	6.2	3.7	4.2
18	1.8	.2	7.0	6.3	2.9	8.8	6.2	2.8	4.4	7.8	4.0	3.7
19	1.5	.1	6.4	6.8	2.9	9.2	6.6	2.4	5.6	8.6	4.6	3.4
20	1.5	.0	5.8	7.2	2.8	10.6	7.0	2.2	5.4	9.4	4.8	3.8
21	1.4	.0	5.6	7.1	2.8	10.8	6.8	2.0	4.8	10.5	5.0	3.9
22	1.2	.0	6.6	8.0	2.9	10.2	6.2	2.0	4.1	10.0	5.0	5.0
23	.8	.1	7.8	12.2	3.2	9.4	5.4	1.8	3.6	8.8	5.0	6.9
24	.6	.1	9.2	13.6	3.6	8.3	4.9	1.6	3.1	8.2	4.8	8.0
25	.6	.1	9.2	13.1	4.0	7.4	4.4	1.6	2.7	9.1	4.4	7.6
26	.8	.1	9.2	12.4	4.5	6.6	4.2	1.8	2.7	9.5	4.2	6.8
27	1.7	.2	9.3	13.2	4.5	6.2	4.0	2.1	3.4	8.3	4.0	5.9
28	1.6	.2	8.8	13.7	4.4	6.6	3.8	2.6	4.0	7.0	4.2	6.0
29	1.8	.3	7.4	12.8	.....	7.2	3.6	3.0	4.0	6.3	4.6	8.4
30	1.8	.3	6.9	10.9	.....	9.5	3.6	2.7	3.8	6.0	4.4	9.0
31	1.9	.....	6.1	8.9	.....	11.1	.....	2.5	.....	5.4	4.0	.....
1907.												
1	8.6	3.0	5.4	11.9	5.5	8.6	3.6	7.8	4.1	3.7	1.5	1.4
2	9.8	3.0	4.8	13.4	9.8	13.0	3.5	6.6	4.8	3.8	1.6	1.3
3	14.4	2.7	4.4	14.1	11.9	14.2	3.5	6.0	4.5	4.0	2.1	1.2
4	15.8	2.6	4.2	14.0	12.0	14.4	4.1	5.8	4.4	3.8	2.8	1.0
5	15.9	2.5	4.0	12.8	11.6	14.5	4.5	5.4	4.5	3.4	2.4	1.0
6	15.8	2.4	3.8	10.7	10.1	14.3	4.6	5.4	4.4	3.0	1.9	1.0
7	15.4	2.2	3.7	9.1	8.8	13.3	4.6	6.8	5.0	2.8	1.6	.9
8	13.9	2.0	3.6	7.8	8.1	11.5	4.9	8.4	6.0	2.4	1.4	.7
9	13.2	2.0	3.5	7.2	7.9	9.6	6.6	9.5	5.8	2.3	1.2	.8
10	12.2	1.9	3.7	6.6	7.6	8.4	7.6	10.0	5.6	2.0	1.6	1.0
11	10.6	1.9	3.8	6.0	7.0	8.3	7.3	11.2	6.3	1.7	1.7	.9
12	9.0	1.8	3.8	5.6	6.4	8.4	7.0	12.5	7.0	1.7	1.6	1.8
13	7.7	1.7	3.8	5.2	5.8	8.5	7.0	11.8	8.2	1.8	1.4	1.9
14	6.6	1.7	3.8	5.0	5.2	8.9	6.4	9.8	8.4	2.8	1.6	2.1
15	5.7	1.8	3.9	4.8	5.0	11.2	6.1	10.7	7.6	3.0	2.0	2.5
16	5.1	1.9	3.9	4.5	4.6	11.0	5.6	9.5	7.2	3.6	2.2	2.4
17	4.8	2.2	4.8	4.2	4.2	10.9	5.1	9.6	7.1	4.4	2.0	2.1
18	4.6	2.6	6.5	4.0	4.0	10.4	4.8	8.6	7.6	4.6	1.7	1.8
19	4.5	4.6	6.4	3.9	3.9	9.7	4.5	7.6	9.1	4.0	1.6	1.4
20	4.9	5.5	5.9	4.0	3.6	8.8	4.5	6.4	8.6	3.6	1.7	1.0
21	5.4	10.0	6.9	4.5	3.4	8.0	4.5	5.4	6.5	3.1	1.7	.9
22	5.4	13.5	7.2	4.6	3.2	7.3	4.6	4.9	4.9	2.8	1.7	1.5
23	5.0	15.2	7.2	4.7	3.2	6.4	5.4	4.4	4.0	2.7	1.6	1.7
24	5.2	16.0	6.8	5.0	3.4	6.0	5.5	4.0	3.7	2.5	1.5	2.7
25	5.8	16.7	6.2	5.7	3.8	5.4	5.6	4.0	3.9	2.3	1.8	3.0
26	5.6	16.3	5.8	5.5	4.2	4.9	6.0	3.7	3.8	2.0	1.9	4.8
27	5.2	14.4	5.4	4.9	4.5	4.6	6.0	3.6	4.0	1.8	1.8	6.9
28	4.5	10.7	5.0	4.4	5.4	4.2	6.0	3.0	4.0	1.5	1.8	6.6
29	4.0	7.7	4.6	4.0	.....	4.0	6.0	3.0	4.0	1.5	1.8	5.9
30	3.6	6.2	5.0	4.0	.....	3.9	6.8	3.0	3.9	1.4	1.7	4.8
31	3.4	.....	7.4	3.8	.....	3.7	.....	3.5	.....	1.5	1.6	.....

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Daily gage height, in feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1872–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1908.												
1	3.9	0.4	6.4	9.5	5.2	6.5	7.8	8.6	4.0	2.2	0.8	3.6
2	3.4	.6	5.3	11.5	6.6	6.5	7.0	7.7	3.8	1.8	.7	2.9
3	3.3	.7	4.4	12.0	6.9	6.4	6.4	6.4	3.8	1.6	.8	2.3
4	2.9	.8	3.9	12.0	6.9	6.6	5.9	5.8	4.2	1.6	1.0	1.8
5	2.5	.7	3.4	12.0	7.0	7.0	5.6	6.8	4.7	1.6	1.1	1.5
6	2.0	.7	3.0	11.6	6.9	7.4	6.8	9.6	4.2	1.4	1.6	1.6
7	1.8	.8	2.8	10.7	6.8	7.7	9.4	8.6	3.9	2.1	1.5	1.5
8	1.8	1.4	2.4	11.2	6.5	7.6	9.6	7.5	4.0	3.4	1.5	1.5
9	1.6	1.5	2.4	11.0	6.2	7.1	8.3	6.6	4.2	4.0	1.8	1.5
10	1.7	2.0	2.3	10.0	7.4	7.0	6.8	6.2	4.1	4.2	2.1	1.6
11	1.7	2.0	2.6	8.8	9.9	7.2	6.0	6.1	4.0	4.2	2.4	2.0
12	1.6	2.0	2.7	8.0	11.0	7.8	5.4	6.1	3.6	4.4	2.6	2.2
13	1.4	2.8	2.7	7.8	10.8	8.0	5.0	6.0	3.2	4.3	2.8	2.0
14	1.2	3.8	3.0	7.8	11.2	8.0	4.6	5.6	3.1	4.0	2.4	1.8
15	1.0	5.4	3.8	10.0	12.5	8.6	4.4	5.2	2.9	3.6	2.2	1.5
16	1.0	6.5	4.8	11.6	14.6	8.9	4.2	5.0	2.7	3.0	1.8	1.1
17	.9	5.2	5.0	12.8	15.3	8.7	4.2	4.8	2.5	2.6	1.4	.9
18	.8	4.2	5.0	12.7	15.8	8.2	4.4	4.7	2.3	2.2	1.1	.7
19	.8	3.5	5.0	11.0	17.0	7.2	7.2	5.2	2.4	2.2	1.0	.6
20	.7	3.2	5.0	9.6	17.0	7.2	7.8	4.8	2.4	2.2	.8	.5
21	.6	3.2	4.6	8.4	16.0	8.0	7.6	4.3	2.7	2.0	.8	.5
22	.5	3.6	4.5	7.6	14.2	8.1	7.0	4.2	2.6	1.7	.8	.6
23	.5	4.0	4.4	6.8	11.4	9.0	6.2	4.0	2.4	1.6	1.0	.7
24	.5	4.8	4.8	6.2	9.2	12.2	6.0	4.2	2.0	1.6	1.6	.6
25	.5	6.2	4.8	5.6	7.9	13.6	6.8	4.2	1.9	1.5	2.4	.5
26	.4	7.6	5.2	5.4	7.5	13.4	7.0	4.4	1.8	1.4	3.6	.4
27	.4	8.6	5.4	4.8	7.3	13.4	7.5	4.6	1.7	1.2	4.1	.3
28	.3	9.2	5.6	4.8	7.1	12.9	8.1	4.6	1.6	1.1	3.6	.2
29	.3	8.9	5.8	4.5	6.8	11.8	8.6	4.4	2.0	1.0	3.2	.1
30	.3	7.9	6.6	4.4	.....	9.6	9.0	4.2	2.3	1.0	3.6	.1
31	.3	.....	8.2	4.4	.....	8.8	.....	4.5	.....	1.0	4.0	.....
1909.												
1	.0	1.3	.6	5.8	3.9	15.7	11.5	9.9	8.2	7.6	2.9	1.4
2	— .1	1.0	.5	5.8	3.7	14.3	11.6	12.6	7.1	6.8	2.9	1.3
3	— .1	2.0	.5	5.8	3.6	12.4	10.8	13.8	6.9	6.3	3.2	1.3
4	— .1	3.1	.6	5.8	3.4	10.4	9.4	14.6	9.2	6.2	4.9	1.4
5	— .1	3.0	.7	5.7	3.3	8.8	8.0	14.8	13.0	6.0	5.4	1.5
6	— .1	2.4	1.4	5.8	3.3	8.0	7.0	14.8	14.8	5.9	5.8	1.4
7	— .1	1.9	3.4	6.4	4.0	8.0	7.1	13.8	15.6	5.6	6.2	1.3
8	.0	1.4	6.2	6.8	4.4	8.0	8.0	11.5	15.6	5.2	6.0	1.2
9	.0	1.0	7.5	7.0	5.2	8.8	8.1	9.2	15.4	5.4	5.2	1.0
10	.0	1.0	8.8	7.2	7.9	10.5	7.6	7.4	14.2	7.0	4.4	1.0
11	.0	.8	9.7	6.8	10.6	12.6	7.4	7.0	12.8	9.9	3.8	1.4
12	.0	.6	9.1	5.9	11.6	14.2	7.0	6.8	11.5	11.8	3.2	1.3
13	.0	.6	8.0	5.4	12.4	16.1	7.0	6.8	10.6	11.2	3.0	1.3
14	.2	.5	6.6	5.1	13.6	18.8	7.7	6.9	9.7	9.6	2.9	1.3
15	.4	.5	5.7	5.8	14.8	19.6	7.4	7.1	9.0	8.0	2.8	1.3
16	.8	.6	5.6	6.8	15.4	19.4	6.9	6.8	8.2	8.0	2.6	1.3
17	1.2	.8	5.2	8.8	14.7	19.0	6.3	6.2	8.2	8.8	2.8	1.3
18	.8	1.0	4.9	10.4	14.2	18.2	6.0	5.6	8.4	8.7	3.0	1.1
19	.6	1.0	4.5	11.0	14.6	16.6	6.0	5.0	8.0	8.0	3.0	1.0
20	.2	1.0	4.0	11.6	14.7	14.2	5.6	4.6	7.4	6.8	5.8	.9
21	.2	1.0	3.6	11.8	14.0	11.7	5.1	4.8	7.1	5.8	7.4	.9
22	.2	1.0	3.6	10.5	13.2	10.0	4.7	6.0	8.6	4.9	6.0	.9
23	.1	.9	5.3	9.4	14.8	9.1	4.8	7.1	9.2	4.4	4.6	1.2
24	.1	.8	6.3	7.8	18.8	8.9	5.9	9.6	9.0	4.0	3.6	1.2
25	.0	.8	7.4	6.6	18.7	8.6	6.8	12.4	8.4	3.4	3.0	1.5
26	.0	.8	8.6	5.8	19.0	8.8	7.6	12.9	7.6	3.3	2.4	1.6
27	— .1	.8	8.8	5.1	18.3	8.4	8.0	11.6	7.4	3.5	2.0	2.1
28	— .1	.7	8.2	4.8	17.1	9.3	7.6	9.6	8.2	3.4	1.8	2.4
29	1.0	.7	7.2	4.4	.....	10.5	7.5	7.6	8.3	3.2	1.6	2.6
30	2.4	.7	6.4	4.0	.....	11.0	7.4	6.5	8.0	3.0	1.5	2.2
31	2.0	.....	5.6	4.0	.....	11.0	.....	7.5	.....	3.1	1.4	.....

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Daily gage height, in feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1872–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1910.												
1	1.8	0.6	0.5	1.8	4.0	6.9	1.9	3.8	6.7	6.0	3.4	1.3
2	1.4	.6	.4	1.6	3.8	7.4	1.8	4.1	5.7	6.0	3.6	1.4
3	1.2	.5	.3	1.3	3.5	8.6	1.6	4.0	5.2	6.4	4.0	1.9
4	.9	.5	.3	1.2	3.4	9.8	1.6	3.8	4.6	7.0	4.2	3.0
5	.8	.4	.3	1.2	3.2	10.6	1.6	3.4	4.3	7.2	4.0	5.0
6	.7	.4	.3	2.5	3.0	10.0	1.5	3.0	4.4	7.8	3.9	5.6
7	.6	.4	.6	5.8	2.9	9.0	1.5	2.7	4.8	8.1	3.6	4.8
8	.5	.4	.8	6.4	2.8	7.8	1.4	2.6	5.2	8.7	3.9	4.2
9	.5	.4	1.6	7.6	3.0	6.8	1.3	2.5	6.1	9.2	4.0	4.2
10	.5	.4	1.9	9.2	3.0	5.9	1.2	3.0	7.2	9.4	4.2	3.8
11	.5	.4	2.6	9.2	3.0	5.5	1.2	4.2	8.0	9.6	4.0	3.6
12	.4	.3	2.8	7.8	3.0	5.2	1.2	5.3	7.3	9.3	4.0	3.0
13	.5	.3	2.6	6.7	2.8	4.7	1.2	5.7	6.6	8.4	3.6	2.8
14	1.2	.3	2.5	5.7	2.7	4.5	1.2	5.7	7.2	7.9	3.4	2.6
15	1.6	.3	2.6	5.0	2.7	4.3	1.2	5.4	7.4	7.4	3.0	2.5
16	2.4	.3	3.1	4.1	3.0	4.2	1.3	4.8	6.8	6.7	2.2	2.4
17	2.8	.3	3.6	3.7	4.8	4.0	3.8	4.4	6.2	6.5	1.9	2.2
18	3.6	.3	3.7	3.6	8.3	3.8	4.9	3.8	6.0	7.8	1.8	2.0
19	3.6	.3	3.7	3.7	9.4	3.7	5.0	3.8	5.9	8.7	1.6	1.6
20	3.0	.3	3.5	4.3	9.8	3.3	5.8	4.2	5.8	7.6	1.4	1.4
21	2.4	.3	3.1	4.6	11.0	3.2	6.1	5.9	5.4	6.6	1.3	1.2
22	2.0	.3	2.7	5.4	11.7	3.0	5.6	7.8	5.4	5.4	1.3	1.0
23	1.6	.3	2.2	6.4	11.3	2.8	5.0	8.8	5.0	4.4	1.6	.9
24	1.4	.6	1.8	7.0	10.6	2.8	4.4	9.1	4.8	4.0	1.8	.8
25	1.2	.6	1.8	7.2	9.4	2.6	4.0	9.8	4.4	4.0	2.0	.8
26	1.0	.5	2.0	7.0	8.4	2.6	3.6	10.5	4.2	3.8	1.8	.7
27	.9	.4	2.4	7.0	7.4	2.4	3.3	10.8	3.9	4.0	1.6	.7
28	.8	.3	2.5	6.2	6.8	2.3	3.2	10.6	3.8	4.2	1.5	.7
29	.8	.4	2.3	5.6	.....	2.2	3.2	9.7	4.0	4.4	1.5	.7
30	.7	.5	2.2	4.9	.....	2.1	3.4	8.7	5.2	3.6	1.4	.7
31	.6	.....	2.0	4.4	.....	2.0	.....	7.7	.....	3.4	1.3	.....
1911.												
1	.7	.2	.4	4.8	4.5	5.4	6.0	5.6	2.0	1.2	2.1	.0
2	.8	.2	.4	8.2	4.6	5.0	5.6	5.5	1.6	1.2	2.7	— .1
3	.8	.2	.4	13.4	5.1	5.0	5.4	5.6	1.5	1.6	2.6	— .2
4	.8	.2	.4	16.8	5.6	4.4	6.9	7.0	1.4	1.6	2.3	— .3
5	.9	.2	.8	17.0	6.6	4.0	12.8	7.8	1.4	1.3	1.9	— .2
6	1.1	.2	2.0	17.0	6.9	4.0	17.0	7.6	1.3	1.2	1.9	.6
7	1.2	.2	4.4	16.6	8.0	4.0	18.5	6.6	1.3	1.1	2.2	1.2
8	1.4	.2	6.2	16.2	9.2	3.8	19.8	5.8	1.4	.8	2.4	1.0
9	1.2	.2	7.6	15.2	13.0	3.6	21.5	5.2	1.3	.7	2.4	.8
10	1.0	.2	7.8	12.4	14.5	4.1	22.0	4.6	1.3	.9	2.2	.8
11	.9	.1	6.6	9.3	15.6	8.0	21.8	4.2	1.2	1.0	2.0	1.0
12	.8	.1	5.7	7.0	15.8	11.0	21.5	4.0	1.1	.8	1.6	1.6
13	.8	.1	4.6	6.0	16.0	11.8	20.8	3.6	1.0	1.0	1.4	.8
14	1.4	.1	3.7	5.4	15.8	10.8	19.4	3.4	1.0	1.2	1.2	.6
15	1.9	.0	2.9	4.7	15.4	8.6	18.2	3.0	1.0	1.6	1.2	.5
16	2.0	.0	2.4	4.2	13.6	6.8	16.3	3.0	.8	1.9	1.1	.4
17	1.7	.0	2.0	4.0	10.6	5.8	14.2	3.0	.7	1.9	1.0	.2
18	1.2	— .1	1.8	3.6	8.6	5.2	13.6	2.7	.4	1.9	1.0	.2
19	.9	— .1	1.6	3.5	7.0	4.7	14.0	2.6	.4	1.9	.9	.1
20	.6	— .1	1.4	3.4	6.4	4.2	16.2	2.5	.4	1.8	1.4	.1
21	.5	— .1	1.0	3.2	6.2	4.0	16.8	2.5	.7	2.4	1.4	.1
22	.4	— .1	1.0	3.0	6.0	3.8	15.8	3.0	.7	3.4	1.2	.2
23	.3	— .1	1.1	3.0	5.4	3.7	14.6	3.5	.7	3.0	1.0	.1
24	.3	— .1	1.1	3.0	5.4	3.7	12.5	4.0	.8	3.0	.8	.1
25	.2	— .1	1.4	2.8	5.0	3.7	10.8	3.6	1.0	2.9	.6	.2
26	.2	— .1	1.4	2.8	5.0	4.0	9.2	3.4	1.2	2.8	.4	.2
27	.2	— .1	1.4	3.0	4.8	4.6	7.7	3.0	1.4	3.4	.3	.2
28	.2	.0	1.4	3.4	5.2	5.2	6.7	2.6	1.5	3.3	.3	.2
29	.2	.1	1.8	4.0	.....	5.8	6.6	2.4	1.9	3.2	.2	.3
30	.2	.5	2.2	4.2	.....	6.0	6.0	2.2	1.4	2.4	.1	.3
31	.2	.....	3.0	4.2	.....	6.2	.....	2.0	.....	2.0	.0	.....

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Daily gage height, in feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1872–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1912.												
1	0.4	0.8	3.0	17.0	10.3	13.6	18.4	17.4	7.2	5.2	3.0	1.8
2	.5	.4	2.8	15.4	11.1	12.7	18.9	16.5	7.3	5.4	2.9	1.7
3	.4	.3	2.5	13.6	11.0	11.6	19.6	16.2	6.4	4.8	2.6	1.4
4	.2	.3	2.2	12.5	10.4	10.0	19.4	16.5	5.7	4.4	2.6	1.3
5	.2	.2	2.0	11.0	9.3	8.6	19.0	15.9	5.4	4.0	3.1	1.3
6	— .1	.2	1.9	9.2	7.8	8.4	18.6	14.6	4.9	4.2	3.3	1.2
7	— .1	.2	1.8	7.9	6.4	8.2	17.5	13.4	4.4	5.8	3.2	1.2
8	— .2	.4	1.5	7.1	5.6	9.0	17.5	12.2	4.0	6.8	3.0	1.2
9	— .2	.5	1.4	7.6	4.9	10.2	17.4	10.6	4.0	7.7	3.6	1.0
10	.1	.8	1.3	8.1	4.4	10.8	16.2	10.0	3.8	7.4	4.1	1.0
11	.3	1.0	1.6	7.6	4.0	10.6	13.1	9.4	3.4	6.4	4.0	.8
12	.5	1.6	3.4	7.0	3.8	10.8	10.2	9.0	3.2	6.2	3.4	.7
13	.5	2.2	5.5	6.6	3.6	10.8	8.6	8.6	3.0	6.2	3.0	.5
14	.4	2.9	7.4	6.1	3.5	11.2	8.0	7.6	2.8	6.1	2.8	.4
15	.5	3.0	8.7	5.6	3.8	13.7	7.6	7.0	2.6	6.0	2.6	.4
16	1.0	3.5	9.2	5.1	4.0	15.6	8.0	6.4	2.4	5.9	2.4	.4
17	1.6	3.4	8.6	4.8	4.4	16.3	9.6	5.9	2.2	5.2	2.2	.4
18	2.4	3.2	8.0	4.4	5.0	16.2	11.0	5.6	2.0	4.4	2.2	.4
19	2.8	3.0	7.6	4.8	5.1	16.2	10.8	5.1	2.6	4.6	2.2	.5
20	3.1	2.9	6.8	5.6	5.3	16.0	10.0	5.0	2.8	4.4	2.2	.4
21	3.5	3.0	5.8	4.9	6.7	15.4	9.5	5.0	2.9	4.2	2.2	.5
22	3.8	3.1	6.2	4.4	9.3	14.0	9.5	5.2	2.8	3.8	2.4	.8
23	4.1	3.0	8.1	4.3	9.8	11.8	9.6	5.1	2.5	3.7	2.4	2.8
24	4.2	2.9	8.6	4.4	10.8	12.4	10.3	4.8	2.4	3.7	2.6	4.0
25	3.6	2.8	8.8	4.5	12.0	13.2	11.0	4.2	2.2	3.7	2.7	4.0
26	2.6	2.7	9.9	4.4	14.1	12.6	11.5	4.0	2.4	3.6	2.8	3.3
27	2.1	2.5	13.6	4.2	15.5	12.6	12.4	3.8	2.6	3.3	3.0	4.7
28	1.6	2.5	15.0	4.6	15.0	13.2	13.9	3.5	3.2	3.0	3.2	3.0
29	1.2	2.6	15.4	6.0	13.8	15.2	15.8	4.2	4.0	3.0	2.9	3.0
30	1.0	3.0	15.4	8.0	.....	17.6	17.4	7.2	4.6	3.0	2.4	3.
31	.9	.....	18.3	9.0	.....	18.0	.....	7.4	.....	3.2	1.9	.....
1913.												
1	2.8	.3	.1	4.6	16.8	14.8	17.2	3.6	7.3	1.5	.6	.3
2	2.6	.3	.2	5.2	15.8	15.2	17.6	3.7	7.9	1.3	.9	.2
3	2.2	.3	.2	6.1	14.2	15.0	17.9	3.6	7.4	1.2	1.0	.2
4	1.9	.3	.6	8.0	12.0	15.2	17.4	3.6	6.6	1.2	1.0	.2
5	1.5	.2	1.8	8.0	10.3	13.8	14.6	3.4	6.0	1.2	1.0	.2
6	1.2	.2	3.6	8.0	9.2	11.5	10.6	3.2	5.6	1.1	.8	.0
7	1.0	.2	4.5	10.0	8.6	9.1	8.8	3.2	5.8	1.1	.8	.0
8	.8	.3	6.2	11.2	8.2	7.7	7.6	2.9	6.0	1.1	.7	.0
9	.7	.3	7.2	12.6	7.8	6.6	6.8	2.8	5.6	1.1	.7	.0
10	.6	.4	7.0	15.0	7.2	5.9	6.2	2.8	5.2	1.1	.7	.0
11	.5	.4	6.3	14.4	7.2	5.8	6.0	2.6	4.8	1.4	.7	.0
12	.4	.4	5.0	14.0	8.3	5.7	5.9	2.6	4.8	1.5	.7	— .1
13	.3	.8	4.2	13.6	10.9	6.4	5.4	2.8	5.5	1.4	.7	— .2
14	.3	1.3	3.5	12.8	11.0	13.0	5.2	2.8	5.4	1.4	.6	— .3
15	.3	1.5	3.0	11.5	11.4	15.5	5.2	2.6	4.7	1.4	.8	— .3
16	.3	1.2	2.6	10.6	11.4	16.5	5.5	2.6	4.1	1.2	1.6	— .3
17	.3	1.0	2.1	9.6	10.2	16.2	5.8	3.0	3.6	1.2	1.3	— .3
18	.3	.9	2.0	9.3	8.9	16.8	5.8	2.8	3.0	1.2	1.2	— .3
19	.6	.7	2.0	9.1	7.8	17.2	6.2	2.7	2.6	1.2	1.0	— .3
20	.8	.6	2.0	8.6	6.8	17.5	6.2	2.8	2.4	.8	.8	— .1
21	1.0	.5	2.0	8.8	6.2	18.5	6.2	2.9	2.2	.7	.7	— .1
22	1.0	.5	1.9	9.5	5.8	17.4	5.8	3.2	2.0	.6	.6	— .1
23	.9	.5	1.8	9.6	5.8	15.5	5.4	4.2	2.2	.6	.6	— .1
24	1.0	.4	2.3	10.3	5.6	13.4	5.0	5.4	2.2	.6	.7	— .1
25	1.0	.3	2.8	13.0	5.2	11.6	4.6	6.4	1.8	.6	.7	.0
26	.9	.3	3.0	13.8	5.0	10.6	4.2	7.5	2.0	.4	.6	.3
27	.8	.3	2.8	14.8	9.1	14.0	4.0	9.2	1.9	.4	.6	.4
28	.6	.2	2.8	16.8	13.8	14.2	4.0	10.2	1.8	.4	.6	.5
29	.6	.2	2.8	17.0	.....	15.8	3.8	10.2	1.6	.4	.5	.8
30	.5	.2	3.0	16.8	.....	16.0	3.8	9.0	1.5	.6	.4	2.0
31	.4	.....	4.0	16.9	.....	16.6	.....	7.8	.....	.6	.4	.....

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Daily discharge, in second-feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1895–1915.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1895.												
1	11,000	10,500	11,500	48,500	75,400	47,600	69,900	48,500	47,600	17,300	47,600	21,300
2	11,000	10,500	11,500	39,400	68,800	52,300	64,500	47,600	42,100	22,000	36,000	22,700
3	10,500	11,000	11,500	32,000	64,500	77,700	59,300	45,700	37,700	25,600	28,600	22,700
4	10,500	11,500	11,500	31,000	63,500	89,400	56,300	43,000	35,100	28,600	24,100	21,300
5	9,990	12,000	11,500	24,800	62,400	115,000	52,300	41,200	32,600	30,200	22,700	21,300
6	9,990	12,600	11,500	23,400	61,400	132,000	48,500	39,400	29,400	29,400	21,300	20,000
7	11,000	12,600	11,000	24,800	62,400	139,000	49,400	41,200	28,600	34,300	20,600	19,300
8	11,500	12,000	11,500	46,600	67,700	136,000	60,400	46,600	27,100	40,300	20,000	19,300
9	11,500	12,000	11,500	58,300	64,500	117,000	77,700	49,400	27,100	47,600	18,600	19,300
10	11,500	12,000	12,000	78,800	58,300	89,400	91,800	54,300	29,400	49,400	19,300	20,000
11	11,500	11,500	13,100	127,000	53,300	77,700	91,800	60,400	30,200	49,400	20,000	22,000
12	11,000	11,500	14,300	160,000	46,600	69,900	91,800	62,400	28,600	43,900	20,000	18,600
13	10,500	11,500	16,700	176,000	41,200	69,900	94,200	64,500	26,300	38,500	18,600	17,300
14	10,500	11,000	26,300	189,000	37,700	87,000	89,400	62,400	24,100	34,300	18,600	16,100
15	10,500	11,000	52,300	197,000	35,100	99,200	76,600	61,400	22,700	31,800	18,600	16,100
16	10,500	11,000	68,800	206,000	34,300	102,000	66,600	60,400	22,000	31,800	18,600	16,100
17	11,500	11,500	68,800	213,000	33,400	102,000	61,400	60,400	21,300	27,100	18,600	18,000
18	13,100	11,000	60,400	181,000	34,300	96,700	58,300	56,300	22,000	26,300	18,000	19,300
19	13,100	11,000	49,400	134,000	35,100	89,400	56,300	52,300	22,700	25,600	18,000	17,300
20	12,600	11,000	39,400	109,000	35,100	123,000	68,800	46,600	22,700	24,800	20,000	16,100
21	11,500	11,000	31,000	107,000	37,700	157,000	80,000	44,800	22,700	23,400	28,600	16,100
22	11,000	11,000	27,900	117,000	40,300	160,000	78,800	44,800	21,300	22,700	39,400	15,500
23	11,000	11,000	23,400	113,000	43,000	161,000	71,000	44,800	20,000	21,300	42,100	14,300
24	11,000	11,000	22,000	104,000	44,800	172,000	61,400	43,000	19,300	19,300	38,500	14,300
25	11,000	11,000	20,000	97,900	47,600	173,000	55,300	37,700	19,300	18,600	35,100	14,300
26	11,000	11,500	18,600	99,200	48,500	172,000	52,300	41,200	19,300	18,000	31,800	13,700
27	10,500	11,500	18,600	103,000	50,400	155,000	53,300	48,500	18,600	17,300	29,400	13,100
28	11,000	11,500	22,700	97,900	48,500	128,000	53,300	60,400	18,600	17,300	29,400	12,600
29	11,000	11,500	29,400	90,600	.....	102,000	54,300	62,400	18,000	19,300	27,100	12,000
30	10,500	11,500	39,400	84,600	.....	85,800	52,300	58,300	17,300	50,400	24,100	11,500
31	10,500	.....	50,400	80,000	.....	75,400	.....	53,300	.....	59,300	22,000	.....
1896.												
1	11,500	11,000	12,000	40,300	69,900	35,100	80,000	41,200	19,300	16,700	46,600	20,600
2	11,500	11,000	13,100	37,700	134,000	33,400	134,000	38,500	18,600	16,700	38,500	18,000
3	11,500	11,000	13,100	36,800	148,000	33,400	178,000	34,300	18,000	18,000	34,300	16,100
4	11,500	11,000	13,700	36,000	155,000	31,800	203,000	32,600	18,000	18,600	31,000	14,300
5	11,000	11,500	13,700	35,100	145,000	30,200	210,000	32,600	22,000	19,300	28,600	14,300
6	11,000	11,500	13,100	35,100	135,000	31,000	216,000	31,000	29,400	20,600	27,900	13,700
7	11,000	12,000	13,100	33,400	129,000	33,400	230,000	31,000	31,000	21,300	25,600	13,100
8	11,000	12,000	13,100	32,600	119,000	36,800	243,000	31,800	29,400	22,000	26,300	12,000
9	11,000	12,000	13,100	33,400	132,000	33,400	254,000	31,000	28,600	23,400	27,100	12,000
10	11,000	12,600	13,100	30,200	139,000	31,800	235,000	29,400	26,300	28,600	25,600	12,000
11	11,000	12,600	13,100	29,400	132,000	31,000	167,000	27,900	26,300	47,600	22,000	15,500
12	11,000	12,600	13,100	27,900	121,000	31,000	96,700	26,300	28,600	94,200	20,600	14,300
13	10,500	12,000	12,600	25,600	119,000	30,200	68,800	23,400	38,500	123,000	19,300	14,900
14	10,500	12,000	12,600	24,100	127,000	30,200	56,300	22,000	38,500	125,000	18,000	14,300
15	11,000	12,600	13,700	23,400	128,000	31,800	48,500	20,600	32,600	108,000	18,000	13,100
16	11,000	13,700	13,700	22,700	124,000	47,600	44,800	19,300	28,600	87,000	18,000	13,100
17	11,000	14,300	13,700	21,300	121,000	74,300	41,200	18,600	24,100	80,000	18,000	13,100
18	11,000	14,300	14,300	20,600	116,000	71,000	39,400	18,000	22,000	78,800	18,000	13,100
19	11,000	14,300	13,700	20,600	103,000	88,200	36,000	17,300	20,000	81,200	17,300	12,000
20	11,000	13,100	14,900	20,000	88,200	127,000	34,300	17,300	19,300	88,200	16,700	12,000
21	11,000	13,100	13,700	19,300	72,100	141,000	32,600	17,300	18,600	80,000	16,100	11,500
22	11,000	13,100	14,300	20,000	61,400	141,000	31,800	16,700	18,000	64,500	15,500	12,000
23	11,000	13,100	14,300	22,000	53,300	127,000	31,800	16,700	19,300	50,400	14,900	11,500
24	11,000	12,000	14,300	26,300	46,600	105,000	31,000	16,700	21,300	43,900	14,900	11,500
25	11,000	12,000	17,300	30,200	43,000	90,600	29,400	17,300	20,600	43,900	14,300	11,000
26	11,000	12,000	39,400	39,400	38,500	78,800	29,400	19,300	20,600	54,300	14,300	11,000
27	10,500	12,000	71,000	49,400	36,800	72,100	34,300	22,000	19,300	52,300	14,300	11,000
28	10,500	12,600	62,400	55,300	35,100	64,500	41,200	24,100	21,300	50,400	14,900	12,000
29	10,500	12,600	45,700	55,300	34,300	59,300	39,400	24,800	19,300	66,600	14,900	13,100
30	10,500	12,600	42,100	49,400	.....	56,300	39,400	23,400	17,300	69,900	15,500	14,300
31	11,500	.....	41,200	43,900	.....	63,500	.....	20,600	.....	58,300	16,700	.....

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Daily discharge, in second-feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1895–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1897.												
1	13,100	11,500	53,300	18,000	29,400	203,000	89,400	41,200	26,300	33,400	35,100	14,900
2	13,100	11,500	65,600	17,300	37,700	208,000	109,000	40,300	25,600	31,000	30,200	14,900
3	13,100	11,500	82,300	16,700	41,200	181,000	107,000	39,400	25,600	27,900	26,300	13,700
4	14,300	12,000	90,600	18,000	59,300	120,000	157,000	40,200	26,300	25,600	23,400	13,100
5	14,900	12,000	89,400	20,600	78,800	91,800	195,000	47,600	25,600	24,100	22,700	13,100
6	15,500	12,600	72,100	21,300	84,600	99,200	210,000	58,300	25,600	22,700	23,000	13,100
7	16,100	12,600	56,300	21,300	89,400	145,000	215,000	59,300	25,600	20,600	23,700	12,600
8	16,100	12,000	45,700	21,300	88,200	161,000	210,000	55,300	24,800	21,300	21,300	12,000
9	14,900	12,000	37,700	21,300	93,000	168,000	220,000	49,400	24,800	22,000	22,060	11,500
10	14,300	14,300	34,300	21,300	99,200	187,000	225,000	46,600	25,600	21,300	23,400	11,500
11	14,900	20,000	31,000	20,600	111,000	208,000	218,000	45,700	25,600	22,700	24,100	11,500
12	13,700	26,300	29,400	20,000	115,000	254,000	195,000	47,600	24,100	25,600	29,400	11,500
13	12,000	37,700	28,600	20,000	107,000	275,000	157,000	67,700	26,300	24,100	30,200	11,500
14	11,000	27,900	28,600	20,000	89,400	299,000	124,000	83,500	31,800	24,100	27,900	11,000
15	11,000	36,000	34,300	23,400	81,200	308,000	103,000	119,000	31,000	25,600	24,100	11,000
16	11,000	42,100	38,500	27,100	77,700	334,000	91,800	146,000	27,100	25,600	23,700	10,500
17	11,000	40,300	36,000	33,400	77,700	352,000	83,500	152,000	25,600	24,100	20,000	10,500
18	11,000	35,100	32,600	52,300	75,400	375,000	78,800	151,000	22,700	22,700	18,600	9,990
19	12,000	30,200	29,400	60,400	69,900	481,000	76,600	132,000	21,300	27,100	16,700	9,990
20	12,000	27,900	27,100	61,400	63,500	460,000	73,200	102,000	20,600	37,700	17,300	9,990
21	11,500	24,100	26,300	58,300	58,300	420,000	67,700	72,100	20,000	42,100	18,600	9,990
22	12,000	22,000	28,600	62,400	58,300	392,000	63,500	58,300	19,300	38,500	18,600	9,500
23	12,000	19,300	29,400	62,400	61,400	355,000	57,300	48,500	20,000	38,500	19,300	9,500
24	12,000	18,000	27,900	59,300	88,200	334,000	53,300	43,900	24,800	37,700	18,600	9,500
25	12,000	16,700	26,300	56,300	128,000	312,000	49,400	39,400	26,300	36,000	17,300	9,500
26	12,000	16,100	24,800	52,300	158,000	290,000	45,700	36,800	27,900	36,800	18,600	9,500
27	12,000	15,500	23,400	48,500	175,000	268,000	43,900	35,100	28,600	45,700	19,300	9,500
28	11,500	20,600	20,600	43,000	193,000	240,000	42,100	33,400	32,600	65,600	18,600	9,500
29	11,500	52,300	20,600	38,500	.....	162,000	40,300	30,200	32,600	72,100	17,300	9,500
30	11,500	52,300	19,300	34,300	.....	117,000	41,200	27,900	31,800	58,300	16,100	9,500
31	11,500	.....	18,600	31,000	.....	94,200	.....	27,100	.....	43,900	16,100	.....
1898.												
1	9,500	11,500	9,990	31,000	102,000	25,600	61,400	50,400	27,100	16,100	36,000	22,700
2	9,500	11,000	11,000	27,900	78,800	25,600	95,400	51,400	24,100	16,100	47,600	22,000
3	9,500	11,000	12,000	27,100	63,500	24,100	119,000	49,400	21,300	16,100	52,300	20,600
4	9,500	11,000	13,100	24,800	55,300	23,400	124,000	44,800	20,000	14,900	50,400	20,600
5	9,500	10,500	20,000	22,700	47,600	22,700	119,000	40,300	20,000	14,900	44,800	45,700
6	9,500	10,500	21,300	22,700	43,900	21,300	117,000	37,700	18,600	14,900	36,000	104,000
7	9,020	11,000	22,000	22,000	40,300	21,300	108,000	34,300	17,300	14,300	33,400	131,000
8	9,020	11,000	25,600	20,600	36,800	21,300	102,000	33,400	16,700	14,300	62,400	139,000
9	9,020	11,000	24,800	20,000	34,300	22,700	96,700	31,800	16,100	14,300	84,600	123,000
10	9,020	11,500	23,400	19,300	31,800	22,700	85,800	28,600	14,900	14,300	89,400	88,200
11	8,550	12,000	22,000	20,600	31,800	22,000	77,700	27,900	14,300	14,300	84,600	66,600
12	9,020	11,500	19,300	24,100	30,200	21,300	74,300	27,900	13,700	15,500	74,300	55,300
13	9,020	11,500	19,300	33,400	28,600	22,700	74,300	27,100	13,700	16,700	66,200	46,600
14	9,020	11,000	16,700	43,900	28,600	22,700	76,600	28,600	13,100	18,600	77,700	39,400
15	9,020	11,000	16,700	119,000	27,100	24,800	74,300	28,600	13,700	19,300	91,800	35,100
16	9,020	11,000	16,100	151,000	26,300	42,100	72,100	27,100	14,300	18,600	102,000	31,000
17	9,500	11,500	16,100	136,000	25,600	43,900	69,900	25,600	14,300	18,000	96,700	27,900
18	9,990	11,500	17,300	107,000	24,100	40,300	68,800	24,100	13,700	18,000	77,700	24,800
19	11,000	11,000	20,000	112,000	24,100	49,400	76,600	23,400	13,700	20,000	61,400	24,100
20	11,000	11,000	25,600	151,000	24,100	46,600	97,900	23,400	14,300	24,100	48,500	23,400
21	11,500	10,500	48,500	129,000	23,400	44,800	97,900	22,700	14,300	28,600	41,200	22,000
22	11,500	9,990	62,400	125,000	22,700	45,700	88,200	22,700	20,000	25,600	36,000	22,000
23	11,500	9,990	71,000	141,000	22,700	43,900	81,200	22,000	25,600	22,700	36,000	21,300
24	12,000	9,990	77,700	139,000	22,000	38,500	72,100	21,300	29,400	21,300	32,600	20,600
25	12,600	9,990	88,200	132,000	22,000	38,500	65,600	21,300	36,800	20,000	31,800	24,100
26	12,000	9,990	77,700	145,000	22,700	36,000	65,600	20,000	31,800	20,000	29,400	27,900
27	12,000	9,990	63,500	157,000	24,100	32,600	61,400	20,000	27,900	21,800	26,300	29,400
28	12,000	9,990	54,300	157,000	25,600	32,600	59,300	20,000	24,100	26,300	24,100	37,700
29	12,000	9,990	44,800	157,000	.....	45,700	56,300	23,400	20,600	27,100	22,700	37,700
30	12,000	9,990	39,400	151,000	.....	55,300	56,300	28,600	17,300	33,400	21,300	32,600
31	11,500	.....	34,300	134,000	.....	57,300	.....	30,200	.....	36,800	22,000	.....

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Daily discharge, in second-feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1895–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1899												
1	26,300	31,800	23,400	33,400	46,600	173,000	164,000	64,500	25,600	20,600	26,300	11,500
2	24,400	29,400	31,800	32,600	48,500	165,000	165,000	58,300	25,600	20,600	26,300	12,000
3	21,300	26,300	31,000	31,000	50,400	164,000	167,000	54,300	25,600	19,300	27,900	12,000
4	20,000	25,600	31,000	30,200	69,900	154,000	162,000	50,400	24,800	19,300	24,800	13,100
5	19,300	24,800	32,600	33,400	142,000	136,000	143,000	46,600	24,800	19,300	22,000	14,300
6	19,300	23,400	33,400	66,600	189,000	132,000	120,000	44,800	25,600	18,000	19,300	15,500
7	38,500	23,400	33,400	117,000	220,000	142,000	113,000	42,100	27,100	17,300	18,000	16,700
8	90,600	22,700	36,000	154,000	228,000	157,000	131,000	44,800	26,300	16,700	16,700	16,100
9	99,200	22,700	38,500	161,000	233,000	168,000	145,000	53,300	24,800	15,500	16,700	15,500
10	82,300	23,400	38,500	154,000	240,000	178,000	151,000	60,400	24,800	15,500	16,100	14,300
11	64,500	24,800	36,800	157,000	250,000	179,000	151,000	64,500	22,700	16,700	15,500	13,700
12	52,300	25,600	34,300	145,000	257,000	158,000	139,000	69,900	21,300	16,700	15,500	13,100
13	46,600	26,300	32,600	117,000	257,000	128,000	123,000	73,200	22,000	16,100	15,500	12,600
14	41,200	27,100	31,000	94,200	264,000	127,000	107,000	69,900	22,700	15,500	15,500	12,000
15	36,000	30,200	29,400	80,000	238,000	213,000	94,200	64,500	27,100	15,500	14,300	12,600
16	34,300	29,400	26,300	71,000	165,000	275,000	83,500	61,400	31,000	14,900	14,300	12,600
17	32,600	27,900	24,800	64,500	107,000	290,000	75,400	61,400	36,000	14,900	14,300	12,600
18	30,200	26,300	24,800	62,400	89,400	304,000	71,000	59,300	36,000	14,300	15,500	13,100
19	29,400	26,300	23,400	60,400	84,600	342,000	66,600	57,300	36,000	13,700	16,100	13,100
20	30,200	26,300	26,300	58,300	88,200	352,000	62,400	50,400	37,700	13,700	15,500	12,600
21	36,000	27,900	34,300	54,300	96,700	346,000	58,300	44,800	33,400	13,700	15,500	12,000
22	45,700	31,000	42,100	52,300	99,200	340,000	56,300	43,000	29,400	14,900	14,900	12,600
23	57,300	39,400	46,600	41,200	96,700	332,000	59,300	38,500	26,300	17,300	14,300	11,500
24	57,300	43,900	43,000	44,800	89,400	325,000	64,500	36,000	24,800	18,600	13,700	11,500
25	50,400	47,600	39,400	60,400	84,600	321,000	87,000	34,300	22,000	20,000	13,100	11,600
26	46,600	46,600	37,700	65,600	104,000	316,000	99,200	31,800	20,600	20,600	13,100	11,000
27	45,700	44,800	36,000	63,500	157,000	308,000	94,200	31,000	19,300	24,100	12,600	11,000
28	45,700	41,200	36,000	63,500	200,000	297,000	90,600	29,400	18,600	24,100	12,000	12,000
29	43,000	37,700	36,000	56,300	.....	281,000	82,300	28,600	18,600	22,000	12,000	12,000
30	37,700	32,400	35,100	50,400	.....	268,000	72,100	26,300	18,000	22,000	12,000	11,500
31	34,300	.....	34,300	46,600	.....	167,000	.....	26,300	.....	24,100	11,500	.....
1900.												
1	11,500	10,500	14,900	35,100	29,400	80,000	71,000	62,400	24,800	94,200	52,300	17,300
2	11,000	10,500	14,300	31,000	27,900	83,500	64,500	59,300	26,300	89,400	47,600	16,700
3	11,000	10,500	13,700	27,100	26,300	73,200	58,300	52,300	29,400	83,500	41,200	16,700
4	11,000	10,500	13,700	23,400	24,100	77,700	56,300	47,600	32,600	81,200	36,000	15,500
5	11,000	10,500	12,600	20,000	26,300	84,600	56,300	41,200	36,000	68,800	31,000	14,300
6	11,000	11,000	13,100	17,300	29,400	91,800	56,300	39,400	46,600	56,300	27,100	14,300
7	11,000	11,000	13,100	16,700	31,000	104,000	60,400	37,700	52,300	48,500	24,100	14,300
8	11,000	11,000	13,100	16,700	31,000	115,000	69,900	36,000	46,300	42,100	22,000	14,300
9	11,000	11,500	12,600	16,700	41,200	117,000	69,900	37,300	39,400	39,400	19,300	13,700
10	10,500	11,500	13,100	18,000	54,300	123,000	66,600	34,300	60,400	36,000	18,000	13,100
11	11,000	11,500	25,600	24,100	58,300	128,000	94,200	33,400	85,300	29,400	16,700	12,600
12	11,000	12,000	38,500	47,600	68,800	131,000	117,000	31,000	47,600	31,000	16,700	12,000
13	11,500	12,000	46,600	57,300	89,400	127,000	117,000	32,600	44,800	31,000	15,500	11,500
14	12,000	12,000	58,300	71,000	126,000	115,000	109,000	28,600	41,200	29,400	14,900	11,500
15	12,600	12,000	64,500	76,600	142,000	96,700	89,400	27,900	48,400	27,900	14,300	11,500
16	13,100	11,500	62,400	74,300	160,000	82,300	77,700	26,300	47,600	34,800	14,300	12,000
17	13,100	11,500	56,300	67,700	168,000	73,200	120,000	25,600	58,400	34,100	14,300	13,100
18	13,100	11,500	48,500	62,400	165,000	65,600	223,000	24,800	52,300	33,400	14,300	14,300
19	12,000	11,000	46,600	61,400	154,000	62,400	240,000	24,100	52,300	34,100	16,100	18,600
20	11,500	11,000	53,300	72,100	112,000	75,400	243,000	23,400	55,300	34,100	15,500	22,000
21	11,500	11,000	46,600	85,800	85,800	90,600	220,000	23,400	62,400	33,400	14,900	24,800
22	11,500	11,500	43,900	94,200	68,800	94,200	175,000	22,700	65,600	29,000	14,900	25,600
23	11,500	11,500	44,800	87,000	68,800	99,200	155,000	24,100	73,200	30,600	15,500	24,800
24	11,000	11,000	58,300	77,700	71,000	117,000	143,000	27,900	91,800	30,600	15,500	21,300
25	11,000	12,000	61,400	66,600	73,200	128,000	125,000	26,300	94,200	30,000	14,300	19,300
26	11,000	12,000	65,600	58,300	73,200	128,000	109,000	24,100	96,700	30,000	14,300	16,700
27	11,000	13,100	62,400	50,400	62,400	115,000	99,200	22,000	125,000	27,900	13,700	14,900
28	11,000	14,300	54,300	43,900	71,000	99,200	84,600	22,000	142,000	31,000	14,300	14,900
29	11,000	15,500	49,400	39,400	.....	89,400	73,200	21,300	131,000	30,200	15,500	14,900
30	10,500	15,500	44,800	36,000	.....	82,300	66,600	20,400	109,000	31,800	18,000	15,500
31	10,500	.....	41,200	31,800	.....	78,800	.....	24,100	.....	46,600	19,300	.....

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Daily discharge, in second-feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1895–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1901.												
1	14,900	25,600	107,000	36,000	53,300	26,300	148,000	105,000	103,000	46,600	16,100	71,000
2	14,300	22,000	91,800	37,700	54,300	26,300	145,000	91,800	95,400	41,200	16,100	68,800
3	14,300	19,300	67,700	39,400	65,600	27,900	145,000	78,800	88,200	36,800	16,100	67,700
4	14,300	18,000	48,500	41,200	104,000	27,900	151,000	67,700	78,800	36,000	16,100	65,600
5	13,100	16,700	41,200	40,300	113,000	27,900	165,000	59,300	67,700	36,800	16,100	64,500
6	12,600	16,700	39,400	39,400	109,000	27,900	176,000	54,300	59,300	36,800	17,300	65,600
7	12,600	18,600	39,400	36,000	105,000	31,000	181,000	49,400	52,300	35,100	18,600	61,400
8	15,500	20,000	43,900	34,300	97,900	32,600	178,000	43,900	47,600	33,400	16,100	51,400
9	15,500	22,000	54,300	31,000	89,400	36,000	162,000	48,500	48,500	31,800	16,100	44,800
10	13,700	23,400	58,300	31,000	87,000	77,700	134,000	41,200	50,400	30,200	43,900	40,300
11	15,500	23,400	56,300	46,600	77,700	125,000	102,000	39,400	49,400	30,200	67,700	36,800
12	26,300	20,680	48,500	116,000	69,900	131,000	81,200	39,400	49,400	33,400	60,400	33,400
13	37,700	19,300	43,000	160,000	64,500	125,000	69,900	37,700	55,300	36,800	50,400	33,400
14	31,800	18,000	36,800	178,000	58,300	112,000	64,500	36,800	49,400	33,400	40,300	31,000
15	29,400	16,700	32,600	189,000	56,300	91,800	62,400	36,000	43,900	29,400	39,400	38,500
16	24,800	16,100	31,000	193,000	56,300	74,300	68,800	35,100	41,200	26,300	69,900	55,300
17	20,000	15,500	27,900	193,000	52,300	62,400	72,100	33,400	40,300	24,100	149,000	63,500
18	18,000	14,900	26,300	181,000	48,500	53,300	78,800	32,600	45,700	23,400	178,000	80,000
19	15,500	14,300	24,800	145,000	44,800	48,500	104,000	31,800	55,300	22,700	205,000	76,600
20	14,900	14,900	23,400	95,400	39,400	44,800	149,000	31,800	60,400	22,700	223,000	78,800
21	14,300	18,000	24,800	71,000	39,400	44,800	178,000	40,300	59,300	22,700	231,000	76,600
22	14,900	19,300	29,400	58,300	36,800	44,800	189,000	63,500	55,300	22,000	238,000	67,700
23	15,500	18,000	29,400	53,300	34,300	43,000	195,000	100,000	51,400	22,700	226,000	58,300
24	16,700	17,300	32,600	52,300	32,600	39,400	192,000	135,000	50,400	22,700	211,000	51,400
25	16,700	19,300	36,000	63,500	32,600	40,300	190,000	155,000	59,300	22,000	192,000	43,900
26	15,500	33,400	38,500	62,400	30,200	44,800	184,000	170,000	57,300	22,000	170,000	38,500
27	13,100	48,500	39,400	62,400	29,400	60,400	172,000	185,000	50,400	20,000	145,000	35,100
28	35,100	65,600	39,400	58,300	27,900	87,000	151,000	192,000	56,300	18,600	116,000	33,400
29	43,000	99,200	36,000	54,300	.....	123,000	131,000	192,000	59,300	17,300	93,000	35,100
30	38,500	109,000	34,300	52,300	.....	139,000	117,000	167,000	53,300	16,700	83,500	36,800
31	32,600	.....	32,600	52,300	.....	152,000	.....	132,000	.....	16,100	76,600	.....
1902.												
1	33,400	16,700	15,500	208,000	184,000	148,000	216,000	36,800	25,600	21,300	17,300	12,000
2	31,800	16,700	15,500	220,000	192,000	173,000	210,000	36,800	26,300	27,100	16,100	12,600
3	30,200	16,100	16,100	233,000	198,000	184,000	203,000	41,200	25,600	45,700	16,100	12,600
4	30,200	16,100	16,100	236,000	197,000	200,000	216,000	62,400	23,400	59,300	14,900	13,700
5	30,200	16,100	16,100	268,000	193,000	225,000	210,000	66,600	21,300	53,300	14,300	13,100
6	30,200	16,100	16,100	272,000	185,000	247,000	167,000	60,400	20,600	45,700	14,300	11,500
7	28,600	16,100	16,100	263,000	172,000	264,000	125,000	49,400	20,600	40,300	14,300	11,500
8	28,600	16,100	16,100	213,000	155,000	273,000	108,000	42,100	20,600	33,400	14,900	11,500
9	27,900	16,100	16,700	136,000	123,000	273,000	102,000	38,500	20,000	28,600	14,900	11,500
10	27,100	16,100	17,300	90,600	89,400	261,000	94,200	36,800	18,600	24,100	14,900	11,500
11	24,800	16,100	18,600	82,300	73,200	236,000	87,000	36,800	18,600	22,700	13,700	11,500
12	24,100	16,100	19,300	60,400	63,500	189,000	80,000	33,400	18,600	21,300	13,700	11,500
13	22,700	16,100	22,000	53,300	58,300	154,000	75,400	31,800	18,600	20,000	13,700	11,500
14	22,700	16,100	27,900	49,400	54,300	120,000	68,800	30,200	18,600	19,300	14,900	11,500
15	22,700	16,100	77,700	46,600	52,300	102,000	64,500	28,600	18,600	18,600	14,900	11,500
16	24,100	15,500	136,000	43,000	52,300	93,000	62,400	27,900	18,600	20,000	14,900	12,000
17	24,800	15,500	175,000	40,300	51,400	99,200	58,300	28,600	18,000	24,100	14,300	12,600
18	24,800	15,500	187,000	38,500	48,500	103,000	56,300	28,600	17,300	24,100	13,700	12,600
19	24,800	15,500	190,000	38,500	46,600	112,000	54,300	27,900	17,300	22,000	12,600	12,600
20	24,100	15,500	190,000	43,000	44,800	115,000	51,400	27,900	17,300	20,000	12,000	12,600
21	22,700	15,500	176,000	45,700	43,900	111,000	50,400	27,100	20,000	18,600	12,000	12,000
22	22,000	14,900	131,000	55,300	44,800	99,200	48,500	27,100	22,700	16,700	12,000	11,500
23	21,300	14,900	83,500	58,300	46,600	96,700	47,600	25,600	24,100	16,100	12,000	11,500
24	20,000	14,900	66,600	60,400	49,400	82,300	46,600	25,600	24,100	15,500	12,000	11,000
25	19,300	15,500	54,300	58,300	56,300	71,000	44,800	26,300	22,700	15,500	12,000	12,000
26	19,300	15,500	55,300	59,300	68,800	68,800	43,000	26,300	21,300	15,500	12,000	14,300
27	18,600	15,500	61,400	75,400	76,600	67,700	41,200	26,300	21,300	14,900	12,000	15,500
28	18,000	15,500	82,300	96,700	102,000	84,600	41,200	25,600	20,000	14,900	11,500	16,100
29	18,000	15,500	125,000	97,900	.....	254,000	38,500	24,800	21,300	14,300	12,000	19,300
30	18,000	15,500	172,000	128,000	.....	243,000	37,700	22,700	21,300	14,900	12,600	22,000
31	17,300	.....	193,000	162,000	.....	235,000	.....	24,100	.....	14,900	12,000	.....

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Daily discharge, in second-feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1895–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1903.												
1	20,600	9,500	47,600	37,700	39,400	165,000	142,000	64,500	52,300	29,400	14,900	12,000
2	21,300	9,500	48,500	40,300	38,500	192,000	139,000	63,500	64,500	29,400	14,900	11,500
3	20,600	9,500	52,300	53,300	44,800	205,000	139,000	60,400	68,800	27,100	16,100	11,000
4	20,600	9,020	55,300	54,300	87,000	216,000	132,000	56,300	81,200	26,300	18,000	11,000
5	20,600	9,500	62,400	53,300	115,000	226,000	120,000	52,300	107,000	24,800	17,300	11,000
6	20,600	9,990	72,100	54,300	138,000	236,000	105,000	48,500	102,000	23,400	19,300	11,000
7	18,000	9,990	66,600	56,300	162,000	230,000	97,900	44,800	94,200	23,400	26,300	11,000
8	16,700	9,990	60,400	54,300	189,000	223,000	100,000	43,900	87,000	24,100	26,300	11,000
9	15,500	9,990	55,300	58,300	200,000	206,000	119,000	43,900	82,300	24,800	27,900	10,500
10	14,300	9,990	49,400	55,300	189,000	200,000	148,000	41,200	84,600	24,100	26,300	10,500
11	15,500	9,990	44,800	55,300	195,000	201,000	172,000	39,400	78,800	24,100	22,000	10,500
12	15,500	11,000	39,400	57,300	200,000	203,000	184,000	38,500	73,200	24,800	23,400	10,500
13	18,000	11,500	34,300	56,300	187,000	203,000	200,000	37,700	67,700	28,600	22,000	9,990
14	15,500	11,500	31,000	55,300	175,000	200,000	226,000	42,100	61,400	28,600	19,300	9,990
15	20,000	11,500	31,000	54,300	173,000	185,000	221,000	60,400	56,300	29,400	18,000	9,990
16	18,000	11,500	59,300	57,300	172,000	162,000	210,000	57,300	49,400	33,400	18,000	9,990
17	17,300	11,500	60,400	54,300	203,000	141,000	193,000	45,700	44,800	35,100	22,000	9,990
18	18,000	11,500	54,300	48,500	215,000	120,000	181,000	43,000	42,100	35,100	24,800	9,990
19	19,300	11,000	54,300	44,800	215,000	102,000	172,000	39,400	36,000	34,300	26,300	9,990
20	18,600	9,990	60,400	43,000	213,000	88,200	162,000	35,100	32,600	32,600	24,100	9,990
21	18,000	9,990	66,600	39,400	211,000	80,000	142,000	32,600	29,400	29,400	22,000	9,990
22	16,700	9,990	73,200	36,000	218,000	77,700	125,000	31,000	27,900	26,300	21,300	9,990
23	15,500	9,990	73,200	34,300	216,000	76,600	111,000	30,200	27,100	23,400	21,300	9,990
24	13,100	10,500	75,400	32,600	190,000	77,700	102,000	27,900	27,900	22,700	20,000	9,990
25	13,100	16,700	75,400	31,000	143,000	91,800	96,700	27,100	27,100	22,700	18,000	9,990
26	12,000	26,300	64,500	29,400	99,200	124,000	87,000	25,600	29,400	20,600	16,700	9,990
27	12,000	29,400	56,300	31,000	80,000	151,000	78,800	24,800	27,900	18,600	16,100	9,990
28	11,000	33,400	48,500	39,400	100,000	168,000	73,200	24,800	27,100	18,000	14,300	9,990
29	10,500	41,200	44,800	43,000	.....	178,000	67,700	22,700	27,100	16,700	13,700	9,990
30	10,500	43,900	42,100	41,200	.....	175,000	64,500	23,400	27,100	16,100	13,100	9,500
31	9,990	.....	39,400	41,200	.....	152,000	.....	31,000	.....	15,500	13,100	.....
1904.												
1	9,020	9,020	11,500	22,700	32,600	50,400	120,000	27,900	27,900	16,100	13,700	.....
2	9,020	9,020	11,500	23,400	27,900	56,300	105,000	30,200	34,300	16,700	14,300	.....
3	9,020	9,990	11,500	22,000	24,800	56,300	85,800	36,000	39,400	18,000	15,500	.....
4	9,020	11,000	11,000	20,000	23,400	53,300	73,200	44,800	36,000	20,000	14,900	.....
5	8,550	13,100	11,000	16,700	22,000	50,400	62,400	43,000	32,600	21,300	14,900	.....
6	8,550	12,600	10,500	15,500	20,600	48,500	55,300	39,400	29,400	24,100	15,500	.....
7	8,550	12,000	9,990	14,900	19,300	46,600	52,300	37,700	26,300	24,100	16,700	.....
8	9,990	11,500	9,990	14,300	18,600	56,300	50,400	35,100	33,400	26,300	16,700	.....
9	11,000	12,000	9,500	13,700	20,000	60,400	55,300	34,300	31,000	24,800	18,600	.....
10	10,500	12,000	9,500	13,700	23,400	67,700	56,300	35,100	27,100	20,600	22,000	.....
11	9,990	11,000	9,500	13,100	32,600	80,000	56,300	36,800	24,800	19,300	24,800	.....
12	9,500	10,500	9,500	12,600	37,700	84,600	52,300	39,400	22,700	18,000	27,900	.....
13	9,990	10,500	9,990	13,100	37,700	82,300	48,500	42,100	20,600	18,000	27,100	.....
14	10,500	10,500	9,990	13,100	36,000	80,000	44,800	44,800	20,600	18,600	24,300	.....
15	10,500	10,500	9,990	13,700	32,600	82,300	41,200	41,200	18,000	18,600	24,100	.....
16	11,000	10,500	9,990	13,700	31,000	81,200	39,400	38,500	17,300	19,300	24,800	.....
17	12,000	11,000	9,990	14,300	28,600	80,000	36,800	34,300	16,700	20,000	23,400	.....
18	11,000	18,000	9,990	14,900	27,100	71,000	34,300	31,000	16,100	20,000	21,300	.....
19	10,500	14,900	10,500	18,000	23,400	60,400	32,600	31,000	16,100	19,300	22,000	.....
20	9,990	14,900	14,300	19,300	22,700	56,300	31,000	29,400	15,500	16,700	23,400	.....
21	9,500	24,100	27,900	21,300	22,700	52,300	31,000	26,300	14,900	16,700	21,300	.....
22	9,500	35,100	20,000	27,900	22,000	78,800	31,000	24,800	14,900	16,100	20,000	.....
23	9,500	30,200	21,300	43,000	23,400	97,900	31,000	23,400	14,300	16,100	17,300	.....
24	9,020	27,100	27,900	48,500	31,000	128,000	29,400	22,000	13,700	15,500	16,700	.....
25	9,020	21,300	30,200	66,600	40,300	160,000	28,600	20,000	13,700	14,300	16,700	.....
26	9,020	17,300	27,900	80,000	50,400	175,000	27,900	19,300	15,500	14,300	15,500	.....
27	9,020	15,500	26,300	66,600	52,300	210,000	27,100	19,300	14,900	13,700	14,900	.....
28	9,020	13,700	23,400	56,300	52,300	206,000	27,100	18,000	14,900	14,300	15,500	.....
29	9,020	13,700	22,000	48,500	48,500	187,000	26,300	18,000	16,700	13,700	16,700	.....
30	9,020	12,000	21,300	43,000	.....	167,000	25,600	18,600	16,700	13,700	16,700	.....
31	9,020	.....	22,000	36,000	.....	143,000	.....	18,600	.....	13,700	15,500	.....

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Daily discharge, in second-feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1895–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1905.												
1			11,000	71,000	25,600	94,200	36,800	56,300	43,000	62,400	24,800	27,900
2			11,300	58,300	24,800	78,800	36,000	64,500	42,100	76,600	23,400	27,900
3			11,500	46,600	24,800	67,700	35,100	64,500	41,200	73,200	22,000	37,700
4			11,500	39,400	25,600	62,400	35,100	60,400	36,800	58,300	22,000	36,000
5			12,000	34,300	28,600	56,300	35,100	52,300	32,600	46,600	22,000	31,000
6			15,500	29,400	35,100	50,400	34,300	46,600	29,400	37,700	22,000	26,300
7			22,000	27,900	49,400	47,600	32,600	45,700	27,900	34,300	22,000	23,400
8			24,800	31,000	62,400	46,600	31,000	46,600	24,800	32,600	20,000	22,000
9			29,400	28,600	117,000	58,300	31,000	44,800	24,100	32,600	19,300	20,600
10			32,600	29,400	160,000	99,200	32,600	44,800	23,400	31,000	19,300	20,000
11			34,300	32,600	175,000	115,000	34,300	50,400	22,000	36,000	20,600	20,600
12			32,600	50,400	201,000	128,000	41,200	56,300	21,300	41,200	22,000	20,600
13			28,600	77,700	201,000	142,000	41,200	55,300	21,300	43,900	27,900	19,300
14			24,800	83,500	193,000	139,000	43,000	50,400	19,300	43,000	37,700	18,000
15			20,000	112,000	161,000	125,000	44,800	46,600	18,600	48,500	46,600	16,700
16			18,000	125,000	136,000	107,000	47,600	41,200	19,300	71,000	55,300	16,700
17			16,700	123,000	117,000	84,600	50,400	44,800	22,000	81,200	60,400	16,100
18			16,100	109,000	102,000	68,800	48,500	52,300	22,000	72,100	56,300	15,500
19			15,500	84,600	91,800	60,400	44,800	73,200	22,000	60,400	50,400	15,500
20			14,900	64,500	94,200	54,300	40,300	89,400	21,300	51,400	46,600	15,500
21			14,300	54,300	145,000	56,300	37,700	89,400	20,600	41,200	41,200	15,500
22			13,700	46,600	175,000	63,500	34,300	77,700	26,300	34,300	38,500	14,300
23			13,100	43,000	182,000	66,600	32,600	71,000	37,700	31,000	34,300	13,700
24			13,100	38,500	185,000	66,600	32,600	94,200	43,000	31,000	32,600	13,100
25			14,300	34,300	182,000	63,500	31,800	104,000	46,600	31,000	29,400	12,600
26			16,700	31,800	168,000	57,300	31,800	99,200	43,000	31,800	27,900	12,600
27			20,000	29,400	146,000	52,300	32,600	91,800	41,200	31,000	34,300	12,000
28			41,200	27,900	115,000	48,500	36,800	77,700	46,600	30,200	39,400	12,000
29			54,300	26,300	.....	46,600	43,000	64,500	50,400	30,200	36,800	11,500
30			71,000	25,600	.....	43,000	51,400	54,300	58,300	29,400	32,600	11,000
31			85,800	26,300	.....	39,400	.....	46,600	.....	27,100	30,200	.....
1906.												
1	11,500	22,000	12,600	54,300	78,800	39,400	124,000	36,000	26,300	34,300	48,500	44,800
2	11,000	20,000	12,600	49,400	75,400	38,500	128,000	35,100	29,400	31,000	48,500	63,500
3	11,500	19,300	13,100	48,500	71,000	46,600	125,000	34,300	31,000	27,900	53,300	75,400
4	11,500	18,000	16,100	56,300	64,500	66,600	107,000	33,400	30,200	27,100	59,300	74,300
5	12,600	16,700	18,000	71,000	60,400	71,000	89,400	33,400	29,400	26,300	60,400	64,500
6	12,600	15,500	33,400	88,200	58,300	80,000	75,400	34,300	31,000	24,800	57,300	56,300
7	12,600	14,300	60,400	96,700	54,300	80,000	66,600	34,300	31,000	22,700	50,400	51,400
8	12,000	14,300	64,500	104,000	50,400	71,000	59,300	35,100	31,000	22,000	50,400	52,300
9	11,500	14,300	60,400	96,700	46,600	64,500	58,300	37,700	26,300	22,000	46,600	56,300
10	13,100	13,700	57,300	89,400	43,000	58,300	56,300	41,200	25,600	22,700	44,800	64,500
11	16,700	13,100	60,400	77,700	39,400	52,300	57,300	48,500	24,800	22,700	41,200	66,600
12	22,000	13,100	68,800	73,200	37,700	46,600	58,300	54,300	23,400	26,300	39,400	64,500
13	20,600	13,100	68,800	74,300	36,000	44,800	62,400	52,300	22,000	33,400	36,000	66,600
14	18,600	13,100	66,600	68,800	34,300	45,700	66,600	44,800	22,000	35,100	36,000	62,400
15	19,300	12,600	64,500	63,500	32,600	77,700	64,500	38,500	22,000	34,300	37,700	53,300
16	22,700	12,600	75,400	58,300	31,000	107,000	61,400	36,000	24,100	50,400	34,300	45,700
17	23,400	12,000	68,800	58,300	31,000	95,400	60,400	31,800	32,600	60,400	36,800	41,200
18	22,000	12,000	68,800	61,400	30,200	89,400	60,400	29,400	43,000	77,700	39,400	36,800
19	20,000	11,500	62,400	66,600	30,200	94,200	64,500	26,300	54,300	87,000	44,800	34,300
20	20,000	11,000	56,300	71,000	29,400	112,000	68,800	24,800	52,300	96,700	46,600	37,700
21	19,300	11,000	54,300	69,900	29,400	115,000	66,600	23,400	46,600	111,000	48,500	38,500
22	18,000	11,000	64,500	80,000	30,200	107,000	60,400	23,400	40,300	104,000	48,500	48,500
23	15,500	11,500	77,700	134,000	32,600	96,700	52,300	22,000	36,000	89,400	48,500	67,700
24	14,300	11,500	94,200	154,000	36,000	83,500	47,600	20,600	31,800	82,300	46,600	80,000
25	14,300	11,500	94,200	146,000	39,400	73,200	43,000	20,600	28,600	93,000	43,000	75,400
26	15,500	11,500	94,200	136,000	43,900	64,500	41,200	22,000	28,600	97,900	41,200	66,600
27	21,300	12,000	95,400	148,000	43,900	60,400	39,400	24,100	34,300	83,500	39,400	57,300
28	20,600	12,000	89,400	155,000	43,000	64,500	37,700	27,900	39,400	68,800	41,200	58,300
29	22,000	12,600	73,200	142,000	.....	71,000	36,000	31,000	39,400	61,400	44,800	84,600
30	22,000	12,600	67,700	116,000	.....	97,900	36,000	28,600	37,700	58,300	43,000	91,800
31	22,700	.....	59,300	90,600	.....	119,000	.....	27,100	.....	52,300	39,400	.....

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Daily discharge, in second-feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1895–1915—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1907.												
1	87,600	31,000	52,300	129,000	53,300	87,000	36,000	77,700	40,300	36,800	20,000	19,300
2	102,000	31,000	46,600	151,000	102,000	145,000	35,100	64,500	46,600	37,700	20,600	18,600
3	165,000	28,600	43,000	161,000	129,000	162,000	35,100	58,300	43,900	39,400	24,100	18,000
4	187,000	27,900	41,200	160,000	131,000	165,000	40,300	56,300	43,000	37,700	29,400	16,700
5	189,000	27,100	39,400	142,000	125,000	167,000	43,900	52,300	43,900	34,300	26,300	16,700
6	187,000	26,300	37,700	113,000	105,000	164,000	44,800	52,300	43,000	31,000	22,700	16,700
7	181,000	24,800	36,800	93,000	89,400	149,000	44,800	66,600	48,500	29,400	20,600	16,100
8	158,000	23,400	36,000	77,700	81,200	124,000	47,600	84,600	58,300	26,300	19,300	14,900
9	148,000	23,400	35,100	71,000	78,800	99,200	64,500	97,900	56,300	25,600	18,000	15,500
10	134,000	22,700	36,800	64,500	75,400	84,600	75,400	104,000	54,300	23,400	20,600	16,700
11	112,000	22,700	37,700	58,300	68,800	83,500	72,100	120,000	61,400	21,300	21,300	16,100
12	91,800	22,000	37,700	54,300	62,400	84,600	68,800	138,000	68,800	21,300	20,600	22,000
13	76,600	21,300	37,700	50,400	56,300	85,800	68,800	128,000	82,300	22,000	19,300	22,700
14	64,500	21,300	37,700	48,500	50,400	90,600	62,400	102,000	84,600	29,400	20,600	24,100
15	55,300	22,000	38,500	46,600	48,500	120,000	59,300	113,000	75,400	31,000	23,400	27,100
16	49,400	22,700	38,500	43,900	44,800	117,000	54,300	97,900	71,000	36,000	24,800	26,300
17	46,600	24,800	46,600	41,200	41,200	116,000	49,400	99,200	69,900	43,000	23,400	24,100
18	44,800	27,900	63,500	39,400	39,400	109,000	46,600	87,000	75,400	44,800	21,300	22,000
19	43,900	44,800	62,400	38,500	38,500	100,000	43,900	75,400	93,000	39,400	20,600	19,300
20	47,600	53,300	57,300	39,400	36,000	89,400	43,900	62,400	87,000	36,000	21,300	16,700
21	52,300	104,000	67,700	43,900	34,300	80,000	43,900	52,300	63,500	31,800	21,300	16,100
22	52,300	152,000	71,000	44,800	32,600	72,100	44,800	47,600	47,600	29,400	21,300	20,000
23	48,500	178,000	71,000	45,700	32,600	62,400	52,300	43,000	39,400	28,600	20,600	21,300
24	50,400	190,000	66,600	48,500	34,300	58,300	53,300	39,400	36,800	27,100	20,000	28,600
25	56,300	201,000	60,400	55,300	37,700	52,300	54,300	39,400	38,500	25,600	22,000	31,000
26	54,300	195,000	56,300	53,300	41,200	47,600	58,300	36,800	37,700	23,400	22,700	46,600
27	50,400	165,000	52,300	47,600	43,900	44,800	58,300	36,000	39,400	22,000	22,000	67,700
28	43,900	113,000	48,500	43,000	52,300	41,200	58,300	31,000	39,400	20,000	22,000	64,500
29	39,400	76,600	44,800	39,400	.....	39,400	58,300	31,000	39,400	20,000	22,000	57,300
30	36,000	60,400	48,500	39,400	.....	38,500	66,600	31,000	38,500	19,300	21,300	46,600
31	34,300	.....	73,200	37,700	.....	36,800	.....	35,100	.....	20,000	20,600	.....
1908.												
1	38,500	13,100	62,400	97,900	50,400	63,500	77,700	87,000	39,400	24,800	15,500	36,000
2	34,300	14,300	51,400	124,000	64,500	63,500	68,800	76,600	37,700	22,000	14,900	30,200
3	33,400	14,900	43,000	131,000	67,700	62,400	62,400	62,400	37,700	20,600	15,500	25,600
4	30,200	15,500	38,500	131,000	67,700	64,500	57,300	56,300	41,200	20,600	16,700	22,000
5	27,100	14,900	34,300	131,000	68,800	68,800	54,300	66,600	45,700	20,600	17,300	20,000
6	23,400	14,900	31,000	125,000	67,700	73,200	66,600	99,200	41,200	19,300	20,600	20,600
7	22,000	15,500	29,400	113,000	66,600	76,600	96,700	87,000	38,500	24,100	20,000	20,000
8	22,000	19,300	26,300	120,000	63,500	75,400	99,200	74,300	39,400	34,300	20,000	20,000
9	20,600	20,000	26,300	117,000	60,400	69,900	83,500	64,500	41,200	39,400	22,000	20,000
10	21,300	23,400	25,600	104,000	73,200	68,800	66,600	60,400	40,300	41,200	24,100	20,600
11	21,300	22,400	27,900	89,400	103,000	71,000	58,300	59,300	39,400	41,200	26,300	23,400
12	20,600	23,400	28,600	80,000	117,000	77,700	52,300	59,300	36,000	43,000	27,900	24,800
13	19,300	29,400	28,600	77,700	115,000	80,000	48,500	58,300	32,600	42,100	29,400	23,400
14	18,000	37,700	31,000	77,700	120,000	80,000	44,800	54,300	31,800	39,400	26,300	22,000
15	16,700	52,300	37,700	104,000	138,000	87,000	43,000	50,400	30,200	36,000	24,800	20,000
16	16,700	63,500	46,600	125,000	168,000	90,600	41,200	48,500	28,600	31,000	22,000	17,300
17	16,100	50,400	48,500	142,000	179,000	88,200	41,200	46,600	27,100	27,900	19,300	16,100
18	15,500	41,200	48,500	141,000	187,000	82,300	43,000	45,700	25,600	24,800	17,300	14,900
19	15,500	35,100	48,500	117,000	206,000	71,000	71,000	50,400	26,300	24,800	16,700	14,300
20	14,900	32,600	48,500	99,200	206,000	71,000	77,700	46,600	26,300	24,800	15,500	13,700
21	14,300	32,600	44,800	84,600	190,000	80,000	75,400	42,100	28,600	23,400	15,500	13,700
22	13,700	36,000	43,900	75,400	162,000	81,200	68,800	41,200	27,900	21,300	15,500	14,300
23	13,700	39,400	43,000	66,600	123,000	91,800	60,400	39,400	26,300	20,600	16,700	14,900
24	13,700	46,600	46,600	60,400	94,200	134,000	58,300	41,200	23,400	20,600	20,600	14,300
25	13,700	60,400	46,600	54,300	78,800	154,000	66,600	41,200	22,700	20,000	26,300	13,700
26	13,100	75,400	50,400	52,300	74,300	151,000	68,800	43,000	22,000	19,300	36,000	13,100
27	13,100	87,000	52,300	46,600	72,100	151,000	74,300	44,800	21,300	18,000	40,300	12,600
28	12,600	94,200	54,300	46,600	69,900	143,000	81,200	44,800	20,600	17,300	36,000	12,000
29	12,600	90,600	56,300	43,900	66,600	128,000	87,000	43,000	23,400	16,700	32,600	11,500
30	12,600	78,800	64,500	43,000	.....	99,200	91,800	41,200	25,600	16,700	36,000	11,500
31	12,600	.....	82,300	43,000	.....	89,400	.....	43,900	.....	16,700	39,400	.....

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Daily discharge, in second-feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1895–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1909.												
1	11,000	18,600	14,300	56,300	38,500	185,000	124,000	103,000	82,300	75,400	30,200	19,300
2	10,500	16,700	13,700	56,300	36,800	164,000	125,000	139,000	69,900	66,600	30,200	18,600
3	10,500	23,400	13,700	56,300	36,000	136,000	115,000	157,000	67,700	61,400	32,600	18,600
4	10,500	31,800	14,300	56,300	34,300	109,000	96,700	168,000	94,200	60,400	47,600	19,300
5	10,500	31,000	14,900	55,300	33,400	89,400	80,000	172,000	145,000	58,300	52,300	20,000
6	10,500	26,300	19,300	56,300	33,400	80,000	68,800	172,000	172,000	57,300	56,300	19,300
7	10,500	22,700	34,300	62,400	39,400	80,000	69,900	157,000	184,000	54,300	60,400	18,600
8	11,000	19,300	60,400	66,600	43,000	80,000	80,000	124,000	184,000	50,400	58,300	18,000
9	11,000	16,700	74,300	68,800	50,400	89,400	81,200	94,200	181,000	52,300	50,400	16,700
10	11,000	16,700	89,400	71,000	78,800	111,000	75,400	73,200	162,000	68,800	43,000	16,700
11	11,000	15,500	100,000	66,600	112,000	139,000	73,200	68,800	142,000	103,000	37,700	19,300
12	11,000	14,300	93,000	57,300	125,000	162,000	68,800	66,600	124,000	128,000	32,600	18,600
13	11,000	14,300	80,000	52,300	136,000	192,000	68,800	66,600	112,000	120,000	31,000	18,600
14	12,000	13,700	64,500	49,400	154,000	236,000	76,600	67,700	100,000	99,200	30,200	18,600
15	13,100	13,700	55,300	56,300	172,000	250,000	73,200	69,900	91,800	80,000	29,400	18,600
16	15,500	14,300	54,300	66,600	181,000	247,000	67,700	66,600	82,300	80,000	27,900	18,600
17	18,000	15,500	50,400	89,400	170,000	240,000	61,400	60,400	82,300	89,400	29,400	18,600
18	15,500	16,700	47,600	109,000	162,000	226,000	58,300	54,300	84,600	88,200	31,000	17,300
19	14,300	16,700	43,900	117,000	168,000	200,000	58,300	48,500	80,000	80,000	31,000	16,700
20	12,000	16,700	39,400	125,000	170,000	162,000	54,300	44,800	73,200	66,600	56,300	16,100
21	12,000	16,700	36,000	128,000	160,000	127,000	49,400	46,600	69,900	56,300	73,200	16,100
22	12,000	16,700	36,000	111,000	148,000	104,000	45,700	58,300	87,000	47,600	58,300	16,100
23	11,500	16,100	51,400	96,700	172,000	93,000	46,600	69,900	94,200	43,000	44,800	18,000
24	11,500	15,500	61,400	77,700	236,000	90,600	57,300	99,200	91,800	39,400	36,000	18,000
25	11,000	15,500	73,200	64,500	235,000	87,000	66,600	136,000	84,600	34,300	31,000	20,000
26	11,000	15,500	87,000	56,300	240,000	89,400	75,400	143,000	75,400	33,400	26,300	20,600
27	10,500	15,500	89,400	49,400	228,000	84,600	80,000	125,000	73,200	35,100	23,400	24,100
28	10,500	14,900	82,300	46,600	208,000	95,400	75,400	99,200	82,300	34,300	22,000	26,300
29	16,700	14,900	71,000	43,000	.....	111,000	74,300	75,400	83,500	32,600	20,600	27,900
30	26,300	14,900	62,400	39,400	.....	117,000	73,200	63,500	80,000	31,000	20,000	24,800
31	23,400	.....	54,300	39,400	.....	117,000	.....	74,300	.....	31,800	19,300	.....
1910.												
1	22,000	14,300	13,700	22,000	39,400	67,700	22,700	37,700	65,600	58,300	34,300	18,600
2	19,300	14,300	13,100	20,600	37,700	73,200	22,000	40,300	55,300	58,300	36,000	19,300
3	18,000	13,700	12,600	18,600	35,100	87,000	20,600	39,400	50,400	62,400	39,400	22,700
4	16,100	13,700	12,600	18,000	34,300	102,000	20,600	37,700	44,800	68,800	41,200	31,000
5	15,500	13,100	12,600	18,000	32,600	112,000	20,600	34,300	42,100	71,000	39,400	48,500
6	14,900	13,100	12,600	27,100	34,000	104,000	20,000	31,000	43,000	77,700	38,500	54,300
7	14,300	13,100	14,300	56,300	30,200	91,800	20,000	28,600	46,600	81,200	36,000	46,600
8	13,700	13,100	15,500	62,400	29,400	77,700	19,300	27,900	50,400	88,200	38,500	41,200
9	13,700	13,100	20,600	75,400	31,000	66,600	18,600	27,100	59,300	94,200	39,400	41,200
10	13,700	13,100	22,700	94,200	31,000	57,300	18,000	31,000	71,000	96,700	41,200	37,700
11	13,700	13,100	27,900	94,200	31,000	53,300	18,000	41,200	80,000	99,200	39,400	36,000
12	13,100	12,600	29,400	77,700	31,000	50,400	18,000	51,400	72,100	95,400	39,400	31,000
13	13,700	12,600	27,900	65,600	29,400	45,700	18,000	55,300	64,500	84,600	36,000	29,400
14	18,000	12,600	27,100	55,300	28,600	43,900	18,000	55,300	71,000	78,800	34,300	27,900
15	20,600	12,600	27,900	48,500	28,600	42,100	18,000	52,300	73,200	73,200	31,000	27,100
16	26,300	12,600	31,800	40,300	31,000	41,200	18,600	46,600	66,600	65,600	24,800	26,300
17	29,400	12,600	36,000	36,800	46,600	39,400	37,700	43,000	60,400	63,500	22,700	24,900
18	36,000	12,600	36,800	36,000	83,500	37,700	47,600	37,700	58,300	77,700	22,000	23,400
19	36,000	12,600	36,800	36,800	96,700	36,800	48,500	37,700	57,300	88,200	20,600	20,600
20	31,000	12,600	35,100	42,100	102,000	33,400	56,300	41,200	56,300	75,400	19,300	19,300
21	26,300	12,600	31,800	44,800	117,000	32,600	59,300	57,300	52,300	64,500	18,600	18,000
22	23,400	12,600	28,600	52,300	127,000	31,000	54,300	77,700	52,300	52,300	18,600	16,700
23	20,600	12,600	24,800	62,400	121,000	29,400	48,500	89,400	48,500	43,000	20,600	16,100
24	19,300	14,300	22,000	68,800	112,000	29,400	43,000	93,000	46,600	39,400	22,000	15,500
25	18,000	14,300	22,000	71,000	96,700	27,900	39,400	102,000	43,000	39,400	23,400	15,500
26	16,700	13,700	23,400	68,800	84,600	27,900	36,000	111,000	41,200	37,700	22,000	14,900
27	16,100	13,100	26,300	68,800	73,200	26,300	33,400	115,000	38,500	39,400	20,600	14,900
28	15,500	12,600	27,100	60,400	66,600	25,600	32,600	112,000	37,700	41,200	20,000	14,900
29	15,500	13,100	25,600	54,300	.....	24,800	32,600	100,000	39,400	43,000	20,000	14,900
30	14,900	13,700	24,800	47,600	.....	24,100	34,300	88,200	50,400	36,000	19,300	14,900
31	14,300	.....	23,400	43,000	.....	23,400	.....	76,600	.....	34,300	18,600	.....

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Daily discharge, in second-feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1895–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1911.												
1	14,900	12,000	13,100	46,600	43,900	52,300	58,300	54,300	23,400	18,000	24,100	11,000
2	15,500	12,000	13,100	82,300	44,800	48,500	54,300	53,300	20,600	18,000	28,600	10,500
3	15,500	12,000	13,100	151,000	49,400	48,500	52,300	54,300	20,000	20,600	27,900	9,990
4	15,500	12,000	13,100	203,000	54,300	43,000	67,700	68,800	19,300	20,600	25,600	9,500
5	16,100	12,000	15,500	206,000	64,500	39,400	142,000	77,700	19,300	18,600	22,700	9,990
6	17,300	12,000	23,400	206,000	67,700	39,400	206,000	75,400	18,600	18,000	22,700	14,300
7	18,090	12,000	43,000	200,000	80,000	39,400	231,000	64,500	18,600	17,300	24,800	18,000
8	19,300	12,000	60,400	193,000	94,200	37,700	254,000	56,300	19,300	15,500	26,300	16,700
9	18,000	12,000	75,400	178,000	145,000	36,000	284,000	50,400	18,600	14,900	26,300	15,500
10	16,700	12,000	77,700	136,000	167,000	40,300	293,000	44,800	18,600	16,100	24,800	15,500
11	16,100	11,500	64,500	95,400	184,000	80,000	290,000	41,200	18,000	16,700	23,400	16,700
12	15,500	11,500	55,300	68,800	187,000	117,000	284,000	39,400	17,300	15,500	20,600	20,600
13	15,500	11,500	44,800	58,300	190,000	128,000	272,000	36,000	16,700	16,700	19,300	15,500
14	19,300	11,500	36,800	52,300	187,000	115,000	247,000	34,300	16,700	18,000	18,000	14,300
15	22,700	11,000	30,200	45,700	181,000	87,000	226,000	31,000	16,700	20,600	18,000	13,700
16	23,400	11,000	26,300	41,200	154,000	66,600	195,000	31,000	15,500	22,700	17,300	13,100
17	21,300	11,000	23,400	39,400	112,000	56,300	162,000	31,000	14,900	22,700	16,700	12,000
18	18,000	10,500	22,000	36,000	87,000	50,400	154,000	28,600	13,100	22,700	16,700	12,000
19	16,100	10,500	20,600	35,100	68,800	45,700	160,000	27,900	13,100	22,700	16,100	11,500
20	14,300	10,500	19,300	34,300	62,400	41,200	193,000	27,100	13,100	22,000	19,300	11,500
21	13,700	10,500	16,700	32,600	60,400	39,400	203,000	27,100	14,900	26,300	19,300	11,500
22	13,100	10,500	16,700	31,000	58,300	37,700	187,000	31,000	14,900	34,300	18,000	12,000
23	12,600	10,500	17,300	31,000	52,300	36,800	168,000	35,100	14,900	31,000	16,700	11,500
24	12,600	10,500	17,300	31,000	52,300	36,800	138,000	39,400	15,500	31,000	15,500	11,500
25	12,000	10,500	19,300	29,400	48,500	36,800	115,000	36,000	16,700	30,200	14,300	12,000
26	12,000	10,500	19,300	29,400	48,500	39,400	94,200	34,300	18,000	29,400	13,100	12,000
27	12,000	10,500	19,300	31,000	46,600	44,800	76,600	31,000	19,300	34,300	12,600	12,000
28	12,000	11,000	19,300	34,300	50,400	50,400	65,600	27,900	20,000	33,400	12,600	12,000
29	12,000	11,500	22,000	39,400	.....	56,300	64,500	26,300	22,700	32,600	12,000	12,600
30	12,000	13,700	24,800	41,200	.....	58,300	58,300	24,800	19,300	26,300	11,500	12,600
31	12,000	.....	31,000	41,200	.....	60,400	.....	23,400	.....	23,400	11,000	.....
1912.												
1	13,100	15,500	31,000	206,000	108,000	154,000	230,000	213,000	71,000	50,400	31,000	22,000
2	13,700	13,100	29,400	181,000	119,000	141,000	238,000	198,000	72,100	52,300	30,200	21,300
3	13,100	12,600	27,100	154,000	117,000	125,000	250,000	193,000	62,400	46,600	27,900	19,300
4	12,000	12,600	24,800	138,000	109,000	104,000	247,000	198,000	55,300	43,000	27,900	18,600
5	12,000	12,000	23,400	117,000	95,400	87,000	240,000	189,000	52,300	39,400	31,800	18,600
6	10,500	12,000	22,700	94,200	77,700	84,600	233,000	168,000	47,600	41,200	33,400	18,000
7	10,500	12,000	22,000	78,800	62,400	82,300	215,000	151,000	43,000	56,300	32,600	18,000
8	9,990	13,100	20,000	69,900	54,300	91,800	215,000	134,000	39,400	66,600	31,000	18,000
9	9,990	13,700	19,300	75,400	47,600	107,000	213,000	112,000	39,400	76,600	36,000	16,700
10	11,500	15,500	18,600	81,200	43,000	115,000	193,000	104,000	37,700	73,200	40,300	16,700
11	12,600	16,700	20,600	75,400	39,400	112,000	146,000	96,700	34,300	62,400	39,400	15,500
12	13,700	20,600	34,300	68,800	37,700	115,000	107,000	91,800	32,600	60,400	34,300	14,900
13	13,700	24,800	53,300	64,500	36,000	115,000	87,000	87,000	31,000	60,400	31,000	13,700
14	13,100	30,200	73,200	59,300	35,100	120,000	80,000	75,400	29,400	59,300	29,400	13,100
15	13,700	31,000	88,200	54,300	37,700	155,000	75,400	68,800	27,900	58,300	27,900	13,100
16	16,700	35,100	94,200	49,400	39,400	184,000	80,000	62,400	26,300	57,300	26,300	13,100
17	20,600	34,300	87,000	46,600	43,000	195,000	99,200	57,300	24,800	50,400	24,800	13,100
18	26,300	32,600	80,000	43,000	48,500	193,000	117,000	54,300	23,400	43,000	24,800	13,100
19	29,400	31,000	75,400	46,600	49,400	193,000	115,000	49,400	27,900	44,800	24,800	13,700
20	31,800	30,200	66,600	54,300	51,400	190,000	104,000	48,500	29,400	43,000	24,800	13,100
21	35,100	31,000	56,300	47,600	65,600	181,000	97,900	48,500	30,200	41,200	24,800	13,700
22	37,700	31,800	60,400	43,000	95,400	160,000	97,900	50,400	29,400	37,700	26,300	15,500
23	40,300	31,000	81,200	42,100	102,000	128,000	99,200	49,400	27,100	36,800	26,300	29,400
24	41,200	30,200	87,000	43,000	115,000	136,000	108,000	46,600	26,300	36,800	27,900	39,400
25	36,000	29,400	89,400	43,900	131,000	148,000	117,000	41,200	24,800	36,800	28,600	39,400
26	27,900	28,600	103,000	43,000	161,000	139,000	124,000	39,400	26,300	36,000	29,400	38,500
27	24,100	27,100	154,000	41,200	182,000	139,000	136,000	37,700	27,900	33,400	31,000	42,100
28	20,600	27,100	175,000	44,800	175,000	148,000	158,000	35,100	32,600	31,000	32,600	36,800
29	18,000	27,900	181,000	58,300	157,000	178,000	187,000	41,200	39,400	31,000	30,200	31,000
30	16,700	31,000	181,000	80,000	.....	216,000	213,000	71,000	44,800	31,000	26,300	31,000
31	16,100	.....	228,000	91,800	.....	223,000	.....	73,200	.....	32,600	22,700	.....

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Daily discharge, in second-feet, of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1895–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1913.												
1	29,400	12,600	11,500	44,800	203,000	172,000	210,000	36,000	72,100	20,000	14,300	12,600
2	27,900	12,600	12,000	50,400	187,000	178,000	216,000	36,800	78,800	18,600	16,100	12,000
3	24,800	12,600	12,000	59,300	162,000	175,000	231,000	36,000	73,200	18,000	16,700	12,000
4	22,700	12,600	14,300	80,000	131,000	178,000	213,000	36,000	64,500	18,000	16,700	12,000
5	20,000	12,000	22,000	80,000	108,000	157,000	168,000	34,300	58,300	18,000	16,700	12,000
6	18,000	12,000	36,000	80,000	94,200	124,000	112,000	32,600	54,300	17,300	15,500	11,000
7	16,700	12,000	43,900	104,000	87,000	93,000	89,400	32,600	56,300	17,300	15,500	11,000
8	15,500	12,600	60,400	120,000	82,300	76,600	75,400	30,200	58,300	17,300	14,900	11,000
9	14,900	12,600	71,000	139,000	77,700	64,500	66,600	29,400	54,300	17,300	14,900	11,000
10	14,300	13,100	68,800	175,000	71,000	57,300	60,400	29,400	50,400	17,300	14,900	11,000
11	13,700	13,100	61,400	165,000	71,000	56,300	58,300	27,900	46,600	19,300	14,900	11,000
12	13,100	13,100	48,500	160,000	83,500	55,300	57,300	27,900	46,600	20,000	14,900	10,500
13	12,600	15,500	41,200	154,000	116,000	62,400	52,300	29,400	53,300	19,300	14,900	9,990
14	12,600	18,600	35,100	142,000	117,000	145,000	50,400	29,400	52,300	19,300	14,300	9,500
15	12,600	20,000	31,000	124,000	123,000	182,000	50,400	27,900	45,700	19,300	15,500	9,500
16	12,600	18,000	27,900	112,000	123,000	198,000	53,300	27,900	40,300	18,000	20,600	9,500
17	12,600	16,700	24,100	99,200	107,000	193,000	56,300	31,000	36,000	18,000	18,600	9,500
18	12,600	16,100	23,400	95,400	90,600	203,000	56,300	29,400	31,000	18,000	18,000	9,500
19	14,300	14,900	23,400	93,000	77,700	210,000	60,400	28,600	27,900	18,000	16,700	9,500
20	15,500	14,300	23,400	87,000	66,600	215,000	60,400	29,400	26,300	15,500	15,500	10,500
21	16,700	13,700	23,400	89,400	60,400	231,000	60,400	30,200	24,800	14,900	14,900	10,500
22	16,700	13,700	22,700	97,900	56,300	213,000	56,300	32,600	23,400	14,300	14,300	10,500
23	16,100	13,700	22,000	99,200	56,300	182,000	52,300	41,200	24,800	14,300	14,300	10,500
24	16,700	13,100	25,600	108,000	54,300	151,000	48,500	52,300	24,800	14,300	14,900	10,500
25	16,700	12,600	29,400	145,000	50,400	125,000	44,800	62,400	22,000	14,300	14,900	11,000
26	16,100	12,600	31,000	157,000	48,500	112,000	41,200	74,300	23,400	13,100	14,300	12,600
27	15,500	12,600	29,400	172,000	93,000	160,000	39,400	94,200	22,700	13,100	14,300	13,100
28	14,300	12,000	29,400	203,000	157,000	162,000	39,400	107,000	22,000	13,100	14,300	13,700
29	14,300	12,000	29,400	206,000	.....	187,000	37,700	107,000	20,600	13,100	13,700	15,500
30	13,700	12,000	31,000	203,000	.....	190,000	37,700	91,800	20,000	14,300	13,100	23,400
31	13,100	.....	39,400	205,000	.....	200,000	.....	77,700	.....	14,300	13,100	.....

Monthly discharge of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1895–1913.

[Drainage area, 30,800 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1895.						
October	13,100	9,990	11,100	0.360	0.42	C.
November	12,600	10,500	11,400	.370	.41	B.
December	68,800	11,000	26,700	.867	1.00	C.
January	213,000	28,400	103,000	3.34	3.85	B.
February	75,400	33,400	49,800	1.62	1.69	B.
March	173,000	47,600	111,000	3.60	4.15	B.
April	94,200	48,500	66,600	2.16	2.41	B.
May	64,500	37,700	51,100	1.66	1.91	B.
June	47,600	17,300	25,800	.838	.94	B.
July	59,300	17,300	30,500	.990	1.14	B.
August	47,600	18,000	25,700	.834	.96	B.
September	22,700	11,500	17,400	.565	.63	B.
The year	213,000	9,990	44,300	1.44	19.51	
1896.						
October	11,500	10,500	11,000	.357	.41	B.
November	14,300	11,000	12,400	.403	.45	B.
December	71,000	12,000	20,700	.672	.77	B.
January	55,300	19,300	32,200	1.05	1.21	B.
February	155,000	34,300	100,000	3.25	3.50	B.
March	141,000	30,200	61,000	1.98	2.28	B.
April	254,000	29,400	98,500	3.20	3.57	B.
May	41,200	16,700	24,600	.799	.92	B.
June	38,500	17,300	23,800	.773	.86	B.
July	125,000	16,700	56,500	1.83	2.11	B.
August	46,600	14,300	21,400	.695	.80	B.
September	20,600	11,000	13,300	.432	.48	B.
The year	254,000	10,500	39,300	1.28	17.36	

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Monthly discharge of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1895–1913—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1897.						
October	16,100	11,000	12,700	0.412	0.48	B.
November	52,300	11,500	23,400	.760	.85	B.
December	90,600	18,600	39,000	1.27	1.46	B.
January	62,400	16,700	34,900	1.13	1.30	B.
February	193,000	29,400	88,980	2.89	3.01	B.
March	481,000	91,800	255,000	8.28	9.55	C.
April	225,000	40,300	115,000	3.73	4.16	B.
May	152,000	27,100	63,800	2.07	2.39	B.
June	32,600	19,300	25,900	.841	.94	C.
July	72,100	20,600	33,000	1.07	1.23	C.
August	35,100	16,100	21,900	.711	.82	B.
September	14,900	9,500	11,100	.360	.40	B.
The year	481,000	9,500	60,300	1.96	26.59	
1898.						
October	12,600	8,550	10,300	.334	.39	C.
November	12,000	9,990	10,800	.351	.39	C.
December	88,200	9,990	33,400	1.08	1.24	B.
January	157,000	19,300	87,200	2.83	3.26	A.
February	102,000	22,000	35,400	1.15	1.20	B.
March	57,300	21,300	33,500	1.09	1.26	B.
April	124,000	56,300	83,200	2.70	3.01	A.
May	51,400	20,000	29,600	.961	1.11	B.
June	36,800	13,100	19,400	.630	.70	B.
July	36,800	14,300	19,900	.646	.74	C.
August	102,000	21,300	52,900	1.72	1.98	B.
September	139,000	20,600	45,500	1.48	1.65	C.
The year	157,000	8,550	38,400	1.25	16.93	
1899.						
October	99,200	19,300	43,100	1.40	1.61	C.
November	47,600	22,700	30,600	.994	1.11	B.
December	46,600	23,400	33,900	1.10	1.27	B.
January	161,000	30,200	74,900	2.43	2.80	B.
February	264,000	46,600	150,000	4.87	5.07	A.
March	352,000	127,000	231,000	7.50	8.65	A.
April	167,000	56,300	107,000	3.47	3.87	B.
May	73,200	26,300	49,100	1.59	1.83	B.
June	37,700	18,000	26,000	.844	.94	C.
July	24,100	13,700	17,900	.581	.67	C.
August	27,900	11,500	16,500	.536	.62	B.
September	16,700	11,000	12,800	.416	.46	B.
The year	352,000	11,000	65,600	2.13	28.90	
1900.						
October	13,100	10,500	11,400	.370	.43	B.
November	15,500	10,500	11,700	.380	.42	B.
December	65,600	12,600	39,000	1.27	1.46	B.
January	94,200	16,700	48,600	1.58	1.82	B.
February	168,000	24,100	76,300	2.48	2.58	B.
March	131,000	62,400	97,700	3.17	3.66	B.
April	243,000	56,300	110,000	3.57	3.98	B.
May	62,400	21,300	31,700	1.03	1.19	B.
June	142,000	24,800	63,600	2.06	2.30	C.
July	94,200	20,000	38,800	1.26	1.45	B.
August	52,300	13,700	20,700	.672	.77	B.
September	25,600	11,500	16,100	.523	.58	B.
The year	243,000	10,500	46,800	1.52	20.64	
1901.						
October	43,000	12,600	20,300	.659	.76	B.
November	109,000	14,300	27,500	.893	1.00	B.
December	107,000	23,400	42,400	1.38	1.59	A.
January	193,000	31,000	80,900	2.62	3.02	A
February	113,000	27,900	61,100	1.98	2.06	A.
March	152,000	26,300	65,400	2.12	2.44	A.
April	195,000	62,400	138,000	4.48	5.00	A.
May	192,000	31,800	81,500	2.65	3.06	B.
June	103,000	40,300	57,800	1.88	2.10	A.
July	46,600	16,100	28,100	.912	1.05	B.
August	238,000	16,100	98,600	3.20	3.69	A.
September	80,000	31,000	53,500	1.74	1.94	A.
The year	238,000	12,600	62,800	2.04	27.71	

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Monthly discharge of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1895–1913—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1902.						
October	33,400	17,300	24,300	0.789	9.91	B.
November	16,700	14,900	15,800	.513	.57	C.
December	193,000	15,500	77,600	2.52	2.90	B.
January	272,000	38,500	114,000	3.70	4.27	B.
February	198,000	43,900	97,200	3.16	3.29	B.
March	273,000	67,700	161,000	5.23	6.03	A.
April	216,000	37,700	91,600	2.97	3.31	B.
May	66,600	22,700	34,000	1.10	1.27	B.
June	26,300	17,300	20,800	.675	.75	C.
July	59,300	14,300	24,600	.799	.92	C.
August	17,300	11,500	13,600	.442	.51	C.
September	22,000	11,000	12,900	.419	.47	B.
The year	273,000	11,000	57,200	1.86	25.20	
1903.						
October	21,300	9,990	16,400	.532	.61	B.
November	43,900	9,020	14,600	.474	.53	C.
December	75,400	31,000	54,800	1.78	2.05	B.
January	58,300	29,400	46,500	1.51	1.74	A.
February	218,000	38,500	157,000	5.10	5.31	B.
March	236,000	76,600	163,000	5.29	6.10	A.
April	226,000	64,500	137,000	4.45	4.96	A.
May	64,500	22,700	40,600	1.32	1.52	A.
June	107,000	27,100	53,800	1.75	1.95	A.
July	35,100	15,500	25,600	.831	.96	B.
August	27,900	13,100	19,900	.646	.74	B.
September	12,000	9,500	10,400	.338	.38	B.
The year	236,000	9,020	61,100	1.98	26.85	
1904.						
October	12,000	8,550	9,640	.313	.36	B.
November	35,100	9,020	14,800	.481	.54	B.
December	30,200	9,500	15,500	.503	.58	B.
January	80,000	12,600	27,800	.903	1.04	B.
February	52,300	18,600	30,500	.990	1.07	B.
March	210,000	46,600	93,800	3.05	3.52	B.
April	120,000	25,600	47,300	1.54	1.72	B.
May	44,800	18,000	31,000	1.01	1.16	B.
June	39,400	13,700	21,900	.711	.79	B.
July	26,300	13,700	18,100	.588	.68	B.
August	27,900	13,700	19,100	.620	.71	C.
September	.....	.....	11,500	.373	.42	D.
The year	210,000	.....	28,400	.922	12.59	
1905.						
October	.....	.....	7,700	.250	.29	D.
November	.....	.....	8,500	.276	.31	D.
December	85,800	11,000	24,500	.795	.92	C.
January	125,000	25,600	53,000	1.72	1.98	B.
February	201,000	24,800	119,000	3.86	4.02	B.
March	142,000	39,400	73,800	2.40	2.77	A.
April	51,400	31,000	38,000	1.23	1.37	A.
May	104,000	41,200	63,100	2.05	2.36	A.
June	58,300	18,600	31,600	1.03	1.15	A.
July	81,200	27,100	44,600	1.45	1.67	A.
August	60,400	19,300	32,800	1.06	1.22	B.
September	37,700	11,000	19,200	.623	.70	A.
The year	201,000	.....	42,500	1.38	18.76	
1906.						
October	23,400	11,000	17,100	.555	.64	A.
November	22,000	11,000	13,600	.442	.49	A.
December	95,400	12,600	60,400	1.96	2.26	A.
January	155,000	48,500	90,300	2.93	3.38	A.
February	78,800	29,400	44,000	1.43	1.49	A.
March	119,000	38,500	75,300	2.44	2.81	B.
April	128,000	36,000	65,800	2.14	2.39	A.
May	54,300	20,600	32,700	1.06	1.22	B.
June	54,300	22,000	32,500	1.06	1.18	B.
July	111,000	22,000	54,400	1.77	2.04	A.
August	60,400	34,300	45,000	1.46	1.68	B.
September	91,800	34,300	59,400	1.93	2.15	A.
The year	155,000	11,000	49,300	1.60	21.73	

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Monthly discharge of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1895–1913—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1907.						
October	189,000	34,300	86,700	2.81	3.24	A.
November	201,000	21,300	66,100	2.15	2.40	A.
December	73,200	35,100	49,100	1.59	1.83	A.
January	161,000	37,700	68,400	2.22	2.56	A.
February	131,000	32,600	63,000	2.05	2.14	A.
March	167,000	36,800	94,100	3.06	3.53	A.
April	75,400	35,100	52,800	1.71	1.91	A.
May	138,000	31,000	69,700	2.26	2.61	B.
June	93,000	36,800	55,600	1.81	2.02	B.
July	44,800	19,300	29,500	.958	1.10	A.
August	29,400	18,000	21,700	.705	.81	B.
September	67,700	14,900	26,300	.854	.95	B.
The year	201,000	14,900	57,000	1.85	25.10	
1908.						
October	38,500	12,600	19,100	.620	.71	A.
November	94,200	13,100	39,900	1.30	1.45	B.
December	82,300	25,600	43,500	1.41	1.63	A.
January	142,000	43,000	92,400	3.00	3.46	A.
February	206,000	50,400	108,000	3.51	3.79	B.
March	154,000	62,400	89,900	2.92	3.37	A.
April	99,200	41,200	66,200	2.15	2.40	A.
May	99,200	39,400	55,500	1.80	2.08	A.
June	45,700	20,600	31,600	1.03	1.15	B.
July	43,000	16,700	26,200	.851	.98	B.
August	40,300	14,900	23,500	.763	.88	B.
September	36,000	11,500	18,600	.604	.67	A.
The year	206,000	11,500	51,000	1.66	22.57	
1909.						
October	26,300	10,500	12,800	.416	.48	A.
November	31,800	13,700	17,700	.575	.64	B.
December	100,000	13,700	54,200	1.76	2.03	A.
January	128,000	39,400	69,200	2.25	2.59	A.
February	240,000	33,400	129,000	4.19	4.36	B.
March	250,000	80,000	139,000	4.51	5.20	B.
April	125,000	45,700	74,000	2.40	2.68	A.
May	172,000	44,800	95,600	3.10	3.57	A.
June	184,000	67,700	105,000	3.41	3.80	A.
July	128,000	31,000	63,200	2.05	2.36	A.
August	73,200	19,300	37,800	1.23	1.42	B.
September	27,900	16,100	19,300	.627	.70	B.
The year	250,000	10,500	67,600	2.19	29.83	
1910.						
October	36,000	13,100	19,300	.627	.72	A.
November	14,300	12,600	13,100	.425	.47	B.
December	36,800	12,600	24,100	.782	.90	A.
January	94,200	18,000	51,200	1.66	1.91	A.
February	127,000	28,600	58,500	1.90	1.98	A.
March	112,000	23,400	50,500	1.64	1.89	A.
April	59,300	18,000	30,500	.990	1.10	B.
May	115,000	27,100	58,700	1.91	2.20	A.
June	80,000	37,700	54,600	1.77	1.98	A.
July	99,200	34,300	65,400	2.12	2.44	B.
August	41,200	18,600	28,900	.938	1.08	B.
September	54,300	14,900	26,100	.847	.94	B.
The year	127,000	12,600	40,000	1.30	17.61	
1911.						
October	23,400	12,000	15,600	.506	.58	A.
November	13,700	10,500	11,300	.367	.41	A.
December	77,700	13,100	29,500	.958	1.10	A.
January	206,000	29,400	80,000	2.60	3.00	B.
February	190,000	43,900	94,300	3.06	3.19	B.
March	128,000	36,000	55,100	1.79	2.06	A.
April	293,000	52,300	167,000	5.42	6.05	B.
May	77,700	23,400	40,800	1.32	1.52	A.
June	23,400	13,100	17,600	.571	.64	A.
July	34,300	14,900	22,900	.744	.86	A.
August	28,600	11,000	19,200	.623	.72	A.
September	20,600	9,500	13,100	.425	.47	B.
The year	293,000	9,500	46,700	1.52	20.60	

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Monthly discharge of Tennessee River at Florence, Ala., for the years ending Sept. 30, 1895–1913—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1912.						
October	41,200	9,990	20,100	0.653	0.75	C.
November	35,100	12,000	23,800	.773	.86	B.
December	228,000	18,600	74,400	2.42	2.79	C.
January	206,000	41,200	75,400	2.45	2.82	C.
February	182,000	35,100	84,000	2.73	2.94	B.
March	223,000	82,300	144,000	4.68	5.40	B.
April	250,000	75,400	154,000	5.00	5.58	B.
May	213,000	35,100	93,100	3.02	3.48	B.
June	72,100	23,400	37,200	1.21	1.35	A.
July	76,600	31,000	47,400	1.54	1.78	A.
August	40,300	22,700	29,500	.958	1.10	A.
September	42,100	13,100	21,300	.692	.77	A.
The year	250,000	9,990	67,000	2.18	29.62	
1913.						
October	29,400	12,600	16,300	.529	.61	A.
November	20,000	12,000	13,800	.448	.50	B.
December	71,000	11,500	32,400	1.05	1.21	B.
January	206,000	44,800	124,000	4.03	4.65	B.
February	203,000	48,500	98,400	3.19	3.32	C.
March	231,000	55,300	152,000	4.94	5.70	B.
April	221,000	37,700	81,500	2.65	2.96	B.
May	107,000	27,900	44,900	1.46	1.68	B.
June	78,800	20,000	41,800	1.36	1.52	A.
July	20,000	13,100	16,700	.542	.62	A.
August	20,600	13,100	15,400	.500	.58	A.
September	23,400	9,500	11,500	.373	.42	B.
The year	231,000	9,500	53,900	1.75	23.77	

Discharge and horsepower table for Tennessee River at Florence, Ala., for the years ending Sept. 30, 1895–1913.

Gage height.	Discharge in second-feet.	Theoretical horsepower per foot of fall.	Days of deficient discharge.									
			1895	1896	1897	1898	1899	1900	1901	1902	1903	1904
−0.62	8,000	909	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
− .51	8,500	966	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
− .40	9,000	1,020	.....	.....	.....	1	.....	.....	.....	.....	.....	3
− .30	9,500	1,080	.....	.....	.....	10	.....	.....	.....	.....	1	17
− .20	10,000	1,140	2	.....	13	28	.....	.....	.....	.....	34	38
.00	11,000	1,250	13	6	15	31	.....	8	.....	.....	41	49
.19	12,000	1,360	62	43	35	55	8	48	.....	14	57	91
.55	14,000	1,590	77	97	60	71	35	76	5	42	65	115
.89	16,000	1,820	82	121	70	86	59	106	22	80	75	144
1.51	20,000	2,270	121	162	97	108	84	124	52	133	100	186
2.22	25,000	2,840	161	194	147	188	119	158	77	178	133	237
2.87	30,000	3,410	182	217	188	222	152	179	94	202	163	263
3.49	35,000	3,980	196	253	207	242	183	194	125	212	179	285
4.07	40,000	4,550	213	273	226	258	205	206	165	221	196	302
5.16	50,000	5,680	251	292	251	282	231	231	205	247	223	318
Over 5.16	Over 50,000	Over 5,680	365	366	365	365	365	365	365	365	365	366

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Discharge and horsepower table for Tennessee River at Florence, Ala., for the years ending Sept. 30, 1895–1913—Continued.

Gage height.	Discharge in second-feet.	Theoretical horsepower per foot of fall.	Days of deficient discharge.								
			1905	1906	1907	1908	1909	1910	1911	1912	1913
−0.62	8,000	909	31	.....	.....	.....	.....	.....	.....	.....	.....
− .51	8,500	966	31	.....	.....	.....	.....	.....	.....	.....	.....
− .40	9,000	1,020	61	.....	.....	.....	.....	.....	.....	.....	.....
− .30	9,500	1,080	61	.....	.....	.....	.....	.....	.....	.....	.....
− .20	10,000	1,140	61	.....	.....	.....	.....	.....	3	2	7
.00	11,000	1,250	61	.....	.....	.....	8	.....	14	4	13
.19	12,000	1,360	67	13	.....	2	19	.....	31	5	21
.55	14,000	1,590	77	34	.....	19	28	38	75	32	70
.89	16,000	1,820	87	42	2	40	46	58	99	37	111
1.51	20,000	2,270	101	52	18	61	84	89	157	52	147
2.22	25,000	2,840	135	86	71	112	96	128	190	74	173
2.87	30,000	3,410	160	104	89	137	104	158	207	106	194
3.49	35,000	3,980	199	134	104	152	125	186	230	143	205
4.07	40,000	4,550	220	167	154	175	138	229	251	172	217
5.16	50,000	5,680	265	207	212	223	156	266	273	210	230
Over 5.16	Over 50,000	Over 5,680	365	365	365	366	65	365	365	366	365

NOTE.—The above table gives the theoretical horsepower per foot fall that may be developed at different rates of discharge, and shows the number of days on which the discharge and corresponding horsepower were respectively less than the amounts given in the columns for discharge and horsepower. In using this table, allowance should be made for the various losses, the principal ones being the wheel loss, which may be as large as 20 per cent, and the head loss, which may be as large as 5 per cent.

TENNESSEE RIVER AT JOHNSONVILLE, TENN.

Location.—At the Nashville, Chattanooga & St. Louis Railway freight elevator, about 1,000 feet below the railway bridge at Johnsonville, Tenn., 160 miles below Florence, Ala., and 96 miles from the mouth of the Tennessee.

Records available.—October 1, 1875, to September 30, 1913.

Drainage area.—38,500 square miles.

Gage.—Staff, at freight elevator on right bank about 1,000 feet below the Nashville, Chattanooga & St. Louis Railway bridge. Gage is in three vertical sections: −0.3 to 12.3 feet, on pile foundation; 12 to 36 feet on upstream elevator guide; 36 to 48 feet on downstream elevator guide. There is also a low-water section extending from −0.3 to −1.5 feet.

Descriptions of this gage appear in the publications of the Signal Service and of the Weather Bureau, and beginning 1903 in "Stages of the Mississippi River and of its principal tributaries," published by the Mississippi River Commission. "Stages of the Ohio River and of its principal tributaries, Part I, 1858 to 1889, inclusive," published by the Signal Service, states:

The river gage, made of 5 by 2-inch cypress lumber, is on the corner of the elevator building. It is graduated from zero to 50 feet. * * * For a zero stage of water the depth of water on Duck River Bar, 15 miles above, is 3.5 feet.

Original gage records contain this note:

Gage owned by railroad company. First used for Signal Service readings during summer, 1885.

"Daily river stages, principal rivers of the United States, Part IV, 1890–1892," published by the Weather Bureau, states:

The river gage, made of 5 by 2-inch cypress lumber, was on the corner of the elevator building. The part above 8 feet was carried away by a steamboat. The lowest water is 0.1 foot below zero of gage. * * *

A new gage was graduated June 1, 1892, on the south lead of elevator, inside the elevator building, from 11.8 feet, the level of the lowest floor, to 48 feet, some distance above the top floor. It was marked to feet and tenths in lead pencil, to be finally marked with copper tacks. The gage was set by leveling from the bench mark. The level of lower floor by the old gage is 12.2 instead of 11.8 inches.

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Part V, 1893–1895, "Daily river stages," states:

The river gage is located on the Nashville, Chattanooga & St. Louis Railroad elevator. The lower section (12.1 feet) is made of hickory timber. The remainder is on the inside post of the elevator and is graduated with copper tacks and wire. * * * Graduation is from 0.1 foot below to 48 feet above zero.

Same description appears in Part VI, 1896–1899. Part VII, 1900–1904, states:

The river gage * * * is located on the elevator on the right bank of the river and is in two sections. The first section (−0.3 to 12 feet) is made of hickory timber and is painted white, with graduations cut into the wood. There is also a low-water extension (−1.5 feet to −0.3 foot), made of 1 by 4-inch poplar timber. The second section (12 to 48 feet) is on the inside post of the elevator and is graduated by means of copper tacks and wires.

Inspection report of December 14, 1904, states:

The lower section is −0.3 to 12 feet, with an extension of poplar, 4 inches wide and 1 inch thick, −0.3 to −1.5 feet. The extension and repainting was completed October 25, 1904.

Part VIII, 1905–6, states:

A new river gage was installed by the Nashville, Chattanooga & St. Louis Railway Co. in March, 1906. It is attached to the railway elevator on the right bank of the river and is in two vertical sections. The first section (−0.3 to 12 feet) is made of hickory timber and is painted white, with graduations cut into the wood. The second section (12 to 48 feet) is attached to the elevator timbers and is painted white, with graduations cut into the wood and painted black. There is also a low-water section extending from 0.3 to 1.5 feet below zero. Graduation extends from 1.5 feet below to 48 feet above zero.

Inspection report of April 18, 1906, states:

The second section of the gage was recently renewed by the railroad company, and first used in January, 1906, but not finally completed until March, 1906.

Same description appears in Parts IX, X, and XI, 1907–1912.

The datum to which the gage is referred has remained the same throughout, but Mr. Balch, the superintendent of the elevator, states that the foundation piles of the elevator are settling, as indicated by the unevenness of the floor of the elevator, which means that there has been some change in the elevation of the gage as referred to the datum. On July 22, 1910, the section −0.3 to 12.3 feet was 0.1 foot too high, assuming the section 12 to 36 feet as being correct. The section −0.3 to 12.3 feet had been torn off by a boat and in being replaced was set 0.1 foot too high, but it is stated that the correction of 0.1 foot was made in the readings before they were recorded by the observer. The bench marks to which the gage was referred could not be found, as noted below; therefore the elevation of the gage could not be checked otherwise than as noted above.

Bench marks.—The following descriptions of bench marks are taken from "Stages of the Mississippi River and of its principal tributaries for 1913:"

Bench mark is top of coping of west abutment of N., C. & St. L. R. R. bridge. It is 44 feet above zero of the gage and 359.89 feet above mean Gulf level.

Top of rail on bridge is 46 feet above zero of gage and 361.89 feet above mean Gulf level.

P. B. M. 25 is top of iron bolt leaded vertically into top face of stone coping of the cylinder or draw pier of the N., C. & St. L. R. R. bridge at Johnsonville, Tenn. It is in northwest corner of northwest quadrant, 10 inches from face of stone coping and 20 inches from iron frame (probably pedestal). Elevation above mean Gulf level, 356.94 feet.

The bench marks described above could not be found by engineers of the Survey on July 22, 1910, but further search may bring them to light. It is believed that these bench marks may have been destroyed when the bridge was raised. The following bench marks were established July 22, 1910, assuming the gage section 12 to 36 feet to be correct. (See "Gage.")

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Bench mark No. 1.—Railroad spike driven in the northwest corner of right abutment of railway bridge. Elevation above zero of gage, 13.64 feet.

Bench mark No. 2.—Horizontal chisel draft inclosed in a chiseled square about 0.2 foot square on north face of right abutment. Stone is in fourth course above ground about 3½ feet from west face of abutment. Elevation above zero of gage, 18.60 feet.

Daily gage height.—Taken from published reports and original records of the Signal Service and the Weather Bureau, and the published reports of the Mississippi River Commission. Values represent one reading per day, taken about 3 p. m., from October, 1875, to December, 1879; about noon, January, 1880; about 1 p. m., February, 1880–April, 1883; about noon, February, 1884–February, 1885; about 1 p. m., March, 1885, to June, 1888; and about 7 a. m., July, 1888, to September, 1913—central time.

Observer, W. H. Johnson, October, 1875–March, 1894; Sallie B. Mathews, April, 1894–September, 1913.

The following notes are taken from the observer's reports:

March, 1882.—During last rise the gage was broken off. A temporary one has been put up and rise and fall of river noted as accurately as possible.

October, 1882.—About middle of October the gage was covered with mud by workmen repairing the elevator. Rise and fall of river taken from an improvised gage.

April, 1884.—Observations taken as accurately as the stage of the water and condition of gage permitted. Since water carried part of Government gage away I have been using the gage that steamboat men use. Another gage has been improvised, which is quite as accurate as the regular gage.

September, 1884.—Tennessee River has been lower for past six weeks than it has ever been in the eight years in which I have taken observations. The fluctuations have been less than common at this point, and for several days at a time river has remained stationary.

The recorded daily gage height September 3–October 31, 1884, does not agree with the daily difference reported by the observer, and it appears that some of the published gage heights during this period may be in error. No observations taken during December, 1884.

No records available August 19, 1877–February 28, 1879; November 1, 1880–December 31, 1881; May 1, 1883–February 4, 1884, and other shorter periods for which no values appear in the tables.

A note, stamped May 24, 1895, appears in the original records of the Weather Bureau under the heading "River Reports, Johnsonville, 1882 to 1891," and states: "River records at Johnsonville, Tenn., are of doubtful accuracy."

Control.—No information relative to control. The discharge measuring section at the bridge, of bowlders and coarse gravel, is apparently permanent.

Discharge measurements.—Made from downstream side of through type railway bridge of six spans and draw span. Total length of draw span is 400 feet; other spans are 150 feet in length. The initial point for soundings is the west side of stone bridge seat on downstream side of left abutment. At extremely high stages the water extends for miles on the left bank and flow occurs through numerous openings in the railway embankment. Discharge measurements by the United States Geological Survey at this station were made first in July, 1910.

Results of observations of the discharge of Tennessee River near Birmingham, Ky., September 5–19, 1903, reduced to three significant figures, are given in the table on page 201. The data are given in detail in the supplement, volume 9, to the annual report for 1904 of the Chief of Engineers of the United States Army, and the following description of the work is taken from the report of Mr. Kivas Tully, assistant engineer, Mississippi River Commission, contained therein.

The Tennessee River reached the prescribed stage for low-water discharge observations early in September, and a small party was organized. Observations

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were made at the section laid out in 1902, 1½ miles below Birmingham, Ky., about 26 miles above the mouth. The party was in charge of Junior Engineer M. A. Bell, assisted by Mr. E. E. Whitehead, and a very complete set of measurements was made from September 5 to 19, comprising observations with Price and Haskell meters and double floats. The gage readings at Florence, Ala., ranged from zero to −0.2 foot. The work was done from a skiff located by means of transit and stadia. The results are given in Table No. 4. The different methods, in the main, agree very closely. At the conclusion of work at this station the Cumberland River was approaching the prescribed low stage, and the party and outfit were transported by wagon across country to that river and began work September 21 at the section used at high water of 1902, which is 1 mile below Rock Castle, Ky., about 53 miles above the mouth. Sixteen sets of observations were made by October 2. The meters were then rated in the river and the party returned to the St. Louis office. The velocity of the river was very low, and as a check on the meter work floats were used, both double floats and rod floats; the double floats give somewhat larger discharges than the meters, but the discrepancies are not large. The gage at Nashville, Tenn., during the observations ranged from 1.2 feet to 0.9 foot. The results are given in Table No. 4. It is thought that these measurements sufficiently determine the low-water discharge, and it was decided by resolution of the Commission that no more observations on these rivers at low water will be required.

From the measurements near Birmingham the following values of discharge at Johnsonville were computed:

No.	Dates used in determining gage heights at Johnsonville (1903).	Gage height and corresponding discharge at Johnsonville.		Dates of discharge measurements near Birmingham (1903).
		Gage height.	Discharge.	
		Feet.	*Second-feet.*	
A	Sept. 3, 4, 5....	1.03	13,200	Sept. 6, 7, 8.
B	Sept. 7, 8, 9....	.90	12,400	Sept. 10, 11, 12.
C	Sept. 11, 12, 13.	.57	11,500	Sept. 14, 15, 16.
D	Sept. 15, 16....	.40	10,300	Sept. 18, 19.

The discharge measuring section below Birmingham is about 67 miles below Johnsonville. In computing the above values of discharge the mean velocity between the two points was assumed to be about 1 mile per hour, and the time required for a given quantity of water to flow from Johnsonville to the measuring section below Birmingham was accordingly taken as three days. The mean gage height for several days of comparatively little change at Johnsonville was taken as the gage height corresponding to the mean discharge for the same number of days near Birmingham, the dates being shown in the table above. A reduction of 200 second-feet in the measured discharge below Birmingham was made in transferring the discharge to Johnsonville to allow for inflow between the two points. The drainage area between Johnsonville and the measuring section below Birmingham is about 1,560 square miles, and in estimating the inflow the discharge from this area was estimated about 0.1 second-foot per square mile on the basis of the discharge of Duck River at Columbia, Tenn., during the low-water periods of 1904 and 1908.

Daily discharge.—Values in the daily discharge tables were computed from the rating table on pages 202–203.

Discharge for certain periods was estimated as noted under "Backwater." The daily gage height published for October 19, 1893, is apparently in error and the daily discharge was estimated.

No discharge values are published prior to the year ending September 30, 1890. The gage height record for the early period is questionable, as noted under "Daily gage height." In addition, comparisons with preliminary computations of discharge at Florence and with the records of discharge at Chattanooga prior to 1890 cast sufficient doubt upon the reliability of discharge values for Johnsonville,

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computed from the published gage heights and the rating table on pages 202–203, to make it necessary to withhold from publication the discharge record at Johnsonville prior to the year ending September 30, 1890. Some of the published data prior to 1900 are questionable as noted under the table of ratios on page 93.

Duration of flow.—The table on pages 239–240 gives the number of days in each year that the daily discharge as given in the tables on pages 222–234 was less than the limiting values of discharge given in the first column of the duration table. In constructing the table, the daily discharge for periods of estimated discharge was assumed to be constant and the same as the estimated mean discharge. For further explanation of the duration table see description of Chattanooga station, page 95.

Backwater.—The extent of the effect on the discharge relation at Johnsonville of backwater from Ohio River has not been determined, but that backwater does, at times, affect the flow at Johnsonville is shown by the following: The sea-level elevation of the zero of the gage on Ohio River at Paducah, Ky., at the mouth of the Tennessee, is 286 feet and of the gage at Johnsonville is 316 feet, as published in Part XI, "Daily river stages," by the United States Weather Bureau. A stationary stage of 30 feet at Paducah would, therefore, put water on the zero of the Johnsonville gage, which is 97 miles from Paducah. In 1904 the stage at Johnsonville fell to −0.9 foot. The flood of March–April, 1913, reached a stage of 54.3 feet at Paducah or a sea-level elevation of 340 feet. This, with no flow in the Tennessee, would put about 24 feet of water on the Johnsonville gage.

Neglecting the backwater curve, it may be observed from the foregoing that whenever the stage at Paducah is over 30 feet for any considerable length of time, the discharge relation at Johnsonville is subject to backwater effect, the amount of which will depend largely on the source of the greater portion of the water passing Paducah—that is, whether it comes from the Tennessee or the Ohio above the Tennessee. It should be noted that when the two high-water discharge measurements at Johnsonville were made, April 13 and 18, 1911, the stage at Paducah was 37 feet and 42 feet respectively. On April 7, 1911, the stage at Paducah was 23 feet and on July 22, 1910, it was 24 feet and on these dates also discharge measurements were made at Johnsonville. The discharge rating table for Johnsonville, on pages 202–203, therefore applies for periods when the effects of backwater are similar to the effects which existed when the discharge measurements were made upon which the rating table is based.

When the stage of Ohio River at Paducah indicated probable backwater effect at Johnsonville, Tenn., the discharge at Johnsonville was estimated, provided the discharge computed from the daily gage height indicated that the backwater effect at the time in question was materially different from the effect at the time the discharge measurements were made upon which the discharge rating table is based. No reduction in discharge as computed from the discharge rating table has been made in cases where the discharge relation appears to be about the same as when the discharge measurements were made.

Those months during a portion of which backwater is believed to have existed are marked "*a*" in the table of monthly discharge. The periods of probable backwater were selected by an inspection of the gage heights at Paducah and Johnsonville and are neither absolute nor well defined. The estimates of discharge for the periods of probable backwater effect are based principally upon a comparison of the discharge at Johnsonville and Florence.

The periods of probable backwater and the estimates of discharge are as follows:

January 16 to April 19, 1890.—Mean discharge, January 16–31, estimated 120,000 second-feet; February 1–28, 140,000 second-feet; March 1–31, 230,000 second-feet; and April 1–19, 130,000 second-feet.

February 14 to April 23, 1891.—No reduction made February 14–28; mean discharge, March 1–31, estimated 230,000 second-feet; and April 1–23, 130,000 second-feet.

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April 6 to May 7 and May 22 to June 18, 1892.—Mean discharge, April 6–30, estimated 240,000 second-feet; May 1–7, 100,000 second-feet. No reduction made May 22 to June 18.

February 18 to March 5, April 18 to May 23, 1893.—No reduction made.

February 11–21, 1894.—No reduction made.

April 5–15, 1896.—No reduction made.

February 27 to April 23, 1897.—February 27 to March 31. No reduction. Mean discharge, April 1–23, estimated 200,000 second-feet.

January 18 to February 7 and March 25 to April 15, 1898.—Mean discharge, January 18–31, estimated 180,000 second-feet; February 1–7, 110,000 second-feet; March 25–31, 60,000 second-feet; and April 1–15, 120,000 second-feet.

January 13–26 and March 1 to April 17, 1899.—No reduction January 13–26 or March 1–31. Mean discharge, April 1–17, estimated 200,000 second-feet.

April 24 to May 8, 1902.—No reduction made.

February 4–10, March 7–24, and April 3–11, 1902.—No reduction made.

December 18–30, 1902, February 8 to March 31, and April 15 to 30, 1903.—Mean discharge, December 18–30, estimated 90,000 second-feet. No reduction February 8–28. Mean discharge, March 1–31, 1903, estimated 190,000 second-feet. No reduction April 15–30.

March 27 to April 15, 1904.—No reduction March 27–31. Mean discharge, April 1–15, estimated 100,000 second-feet.

March 15–20, 1905.—No reduction made.

April 1–16, 1906.—Mean discharge, estimated 110,000 second-feet.

November 25–30, 1906, January 4 to February 9, and March 8 to April 2, 1907.—No reduction November 25–30, 1906; mean discharge, January 4–31, estimated 80,000 second-feet; February 1–9, 120,000 second-feet; and March 8–31, 110,000 second-feet. No reduction April 1 and 2.

February 15 to April 23 and May 10–23, 1908.—Mean discharge, February 15–29, estimated 170,000 second-feet; March 1–31, 110,000 second-feet; April 1–23, 80,000 second-feet; and May 10–23, 70,000 second-feet.

May 6–15, 1909.—No reduction made.

January 23 to February 1 and February 27 to March 19, 1910.—No reduction made.

February 9–17 and April 10–28, 1911.—No reduction made.

December 29, 1911, to January 9, 1912, and February 28 to May 16, 1912.—No reduction December 29 to January 9, and February 28–29. Mean discharge, March 1–31, estimated 170,000 second-feet; April 1–30, 190,000 second-feet; and May, 1–16, 180,000 second-feet.

January 10 to February 12 and March 22 to April 23, 1913.—Mean discharge, January 10–31, estimated 180,000 second-feet; February 1–12, 160,000 second-feet; March 22–31, 230,000 second-feet; and April 1–23, 140,000 second-feet.

Floods.—On March 24, 1897, the river reached a stage of 48.0 feet, which is the highest on record about which is no question.

"Daily river stages, Part IV, 1890–1892," states:

> The highest water, 48 feet, occurred in January or February, 1882. This does not agree with record of stages at that time, which must be wrong. The high water estimated from the Chattanooga stages as being March 7, 1875, marked by a stone under ground, was 45.3 feet. In 1867 there were 44.8 feet.

Winter flow.—Discharge relation not materially affected by ice.

Regulation.—The flow at Johnsonville recorded in the following tables is not believed to have been affected by other than natural causes.

Ratios.—The ratios of monthly and yearly mean discharge of Tennessee River at Chattanooga, Florence, and Johnsonville are given in the table on pages 88–93.

For those months in which the discharge was estimated or partly estimated, the ratios must not be taken as an index of the accuracy of the estimates, because in

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many cases the estimates were so made as to yield what appeared to be a reasonable ratio of the Florence to the Johnsonville discharge. A discussion of the ratios is given with the table.

Accuracy.—No accuracy ratings have been assigned to the results at this station, but it is believed that the records published in the following tables are as accurate and reliable as the obtainable base data will yield and the records are believed to be free from gross errors.

Cooperation.—The gage height record, as noted above, was taken from the records of the United States Weather Bureau and of the Mississippi River Commission.

Discharge measurements of Tennessee River at Johnsonville, Tenn, during 1910–1913.

No.	Date.	Hydrographer.	Method.[a]	Coefficient.	Gage height.	Discharge.
	1910.				*Feet.*	*Sec.-ft.*
1	July 22	Horton and Dort	Subsurface	0.89	12.25	86,500
2	July 28	...do	...do	.89	6.92	47,700
3	Oct. 16	Horton and Bolster	0.2 and 0.8 depth.	1.00	3.06	21,400
4	Nov. 6	C. T. Bailey	...do	1.00	1.30	13,300
	1911.					
5	Apr. 7	C. T. Bailey	Subsurface	.89	24.76	206,000
6	Apr. 13	Horton and Bailey	...do	.89	32.06	[b] 262,000
7	Apr. 18	C. T. Bailey	...do	.89	35.67	[b] 267,000
		Flood channels.				
	Apr. 14	Horton and Bailey	0.6 depth	1.00	33.6	5,510
	Apr. 17	C. T. Bailey	...do	1.00	36.03	27,700

[a] All measurements made with small Price current meter.
[b] Does not include flow in flood channels. See values for flood channels.

NOTE.—See "Discharge measurements" in station description.

Discharge measurements of Tennessee River near Birmingham, Ky., 67 miles below Johnsonville, Tenn., in 1903 by the Mississippi River Commission.

[Drainage area, 40,000 square miles.]

No.	Date.	Gage height. Local.	Gage height. Johnsonville.[a]	Discharge.	Method.[b]	Mean discharge for day.	No.	Date.	Gage height. Local.	Gage height. Johnsonville.[a]	Discharge.	Method.[b]	Mean discharge for day.
		Feet.	*Feet.*	*Sec.-ft.*		*Sec.-ft.*			*Feet.*	*Feet.*	*Sec.-ft.*		*Sec.-ft.*
1	Sept. 5	[c] 0.92	1.0	14,100	H...	13,800	22	Sept. 10	.....	.....	12,800	P...	.....
2	...do	.....	.....	13,000	P...	.....	23	Sept. 11	.68	.6	11,900	H...	12,000
3	...do.[d]	.92	.....	14,200	H...	.....	24	...do	.....	.....	12,100	P...	.....
4	Sept. 6	.90	1.0	13,300	H...	13,400	25	...do.[d]	.68	.....	11,800	H...	.....
5	...do.[d]	.90	.....	14,000	H...	.....	26	...do.[d]	.....	.....	12,300	P...	.....
6	...do.[d]	.....	.....	13,000	P...	.....	27	Sept. 12	.62	.6	12,900	H...	13,200
7	Sept. 7	.90	1.0	13,600	H...	13,500	28	...do	.....	.....	13,700	P...	.....
8	...do	.....	.....	13,700	P...	.....	29	...do.[d]	.62	.....	12,800	H...	.....
9	...do	.90	.....	13,400	H...	.....	30	...do.[d]	.....	.....	13,300	P...	.....
10	...do	.....	.....	13,200	P...	.....	31	Sept. 14	.51	.5	11,900	H...	12,000
11	...do.[d]	.90	.....	13,400	H...	.....	32	...do	.....	.....	12,400	P...	.....
12	...do.[d]	.....	.....	13,800	P...	.....	33	...do.[d]	.51	.....	11,600	H...	.....
13	Sept. 8	.86	.....	13,200	H...	13,400	34	...do.[d]	.....	.....	12,100	P...	.....
14	...do	.....	.9	13,300	P...	.....	35	Sept. 15	.49	.4	11,600	H...	12,000
15	...do.[d]	.86	.....	13,400	H...	.....	36	...do	.....	.....	12,400	P...	.....
16	...do.[d]	.....	.....	13,900	P...	.....	37	Sept. 16	.48	.4	10,600	H...	11,000
17	Sept. 9	.80	.....	12,500	H...	12,800	38	...do	.....	.....	11,400	P...	.....
18	...do	.....	.8	12,900	P...	.....	39	Sept. 18	.34	.3	10,400	H...	10,400
19	...do.[d]	.80	.....	12,700	H...	.....	40	...do.[d]	.34	.....	10,300	H...	.....
20	...do.[d]	.....	.....	13,200	P...	.....	41	Sept. 19	.35	.3	10,800	H...	10,800
21	Sept. 10	.71	.7	12,500	H...	12,600							

[a] Regular observation at Johnsonville at 7 a. m. central time. Gage heights at Johnsonville Sept. 1–4, 1903, were 1.4, 1.3, 1.1, and 1.0 feet, respectively.
[b] H, Haskell meter; P, Price meter. Results are from simultaneous observations with two meters. The meters were submerged at 0.6 depth.
[c] Change in 24 hours was −0.10 foot.
[d] Observations made in the afternoon. All other observations were made in the morning.

NOTE.—See "Discharge measurements" in station description.

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Discharge rating table for Tennessee River at Johnsonville, Tenn., from Oct. 1, 1889, to Sept. 30, 1913.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-feet.*	*Feet.*	*Sec.-feet.*	*Feet.*	*Sec.-feet.*	*Feet.*	*Sec.-feet.*
−1.00	6,950	6.80	45,530	14.60	109,720	22.40	179,200
− .90	7,150	6.90	46,240	14.70	110,590	22.50	180,100
− .80	7,360	7.00	46,960	14.80	111,460	22.60	181,000
− .70	7,580	7.10	47,680	14.90	112,330	22.70	181,900
− .60	7,810	7.20	48,400	15.00	113,200	22.80	182,800
− .50	8,050	7.30	49,130	15.10	114,080	22.90	183,700
− .40	8,300	7.40	49,860	15.20	114,960	23.00	184,600
− .30	8,560	7.50	50,590	15.30	115,840	23.10	185,500
− .20	8,820	7.60	51,320	15.40	116,720	23.20	186,400
− .10	9,090	7.70	52,060	15.50	117,600	23.30	187,300
.00	9,370	7.80	52,800	15.60	118,480	23.40	188,200
.10	9,650	7.90	53,540	15.70	119,360	23.50	189,100
.20	9,940	8.00	54,280	15.80	120,240	23.60	190,000
.30	10,240	8.10	55,030	15.90	121,120	23.70	190,900
.40	10,540	8.20	55,780	16.00	122,000	23.80	191,800
.50	10,850	8.30	56,540	16.10	122,880	23.90	192,700
.60	11,170	8.40	57,300	16.20	123,760	24.00	193,600
.70	11,500	8.50	58,070	16.30	124,640	24.10	194,500
.80	11,840	8.60	58,840	16.40	125,520	24.20	195,400
.90	12,190	8.70	59,620	16.50	126,400	24.30	196,300
1.00	12,550	8.80	60,410	16.60	127,280	24.40	197,200
1.10	12,920	8.90	61,200	16.70	128,160	24.50	198,100
1.20	13,300	9.00	62,000	16.80	129,040	24.60	199,000
1.30	13,690	9.10	62,810	16.90	129,920	24.70	199,900
1.40	14,080	9.20	63,620	17.00	130,800	24.80	200,800
1.50	14,480	9.30	64,430	17.10	131,690	24.90	201,700
1.60	14,880	9.40	65,250	17.20	132,580	25.00	202,600
1.70	15,290	9.50	66,070	16.30	133,470	25.10	203,500
1.80	15,700	9.60	66,890	17.40	134,360	25.20	204,400
1.90	16,120	9.70	67,710	17.50	135,250	25.30	205,300
2.00	16,540	9.80	68,540	17.60	136,140	25.40	206,200
2.10	16,960	9.90	69,370	17.70	137,030	25.50	207,100
2.20	17,390	10.00	70,200	17.80	137,920	25.60	208,000
2.30	17,830	10.10	71,030	17.90	138,810	25.70	208,900
2.40	18,280	10.20	71,860	18.00	139,700	25.80	209,800
2.50	18,740	10.30	72,690	18.10	140,590	25.90	210,700
2.60	19,210	10.40	73,530	18.20	141,480	26.00	211,600
2.70	19,690	10.50	74,370	18.30	142,370	26.10	212,500
2.80	20,180	10.60	75,210	18.40	143,260	26.20	213,400
2.90	20,680	10.70	76,050	18.50	144,150	26.30	214,300
3.00	21,190	10.80	76,900	18.60	145,040	26.40	215,200
3.10	21,710	10.90	77,750	18.70	145,930	26.50	216,100
3.20	22,240	11.00	78,600	18.80	146,820	26.60	217,000
3.30	22,780	11.10	79,460	18.90	147,710	26.70	217,900
3.40	23,330	11.20	80,320	19.00	148,600	26.80	218,800
3.50	23,890	11.30	81,180	19.10	149,500	26.90	219,700
3.60	24,460	11.40	82,040	19.20	150,400	27.00	220,600
3.70	25,030	11.50	82,900	19.30	151,300	27.10	221,500
3.80	25,610	11.60	83,760	19.40	152,200	27.20	222,400
3.90	26,200	11.70	84,620	19.50	153,100	27.30	223,300
4.00	26,800	11.80	85,480	19.60	154,000	27.40	224,200
4.10	27,410	11.90	86,340	19.70	154,900	27.50	225,100
4.20	28,030	12.00	87,200	19.80	155,800	27.60	226,000
4.30	28,650	12.10	88,060	19.90	156,700	27.70	226,900
4.40	29,280	12.20	88,920	20.00	157,600	27.80	227,800
4.50	29,910	12.30	89,780	20.10	158,500	27.90	228,700
4.60	30,550	12.40	90,640	20.20	159,400	28.00	229,600
4.70	31,190	12.50	91,500	20.30	160,300	28.10	230,500
4.80	31,830	12.60	92,360	20.40	161,200	28.20	231,400
4.90	32,480	12.70	93,220	20.50	162,100	28.30	232,300
5.00	33,130	12.80	94,080	20.60	163,000	28.40	233,200
5.10	33,790	12.90	94,940	20.70	163,900	28.50	234,100
5.20	34,450	13.00	95,800	20.80	164,800	28.60	235,000
5.30	35,120	13.10	96,670	20.90	165,700	28.70	235,900
5.40	35,790	13.20	97,540	21.00	166,600	28.80	236,800
5.50	36,470	13.30	98,410	21.10	167,500	28.90	237,700
5.60	37,150	13.40	99,280	21.20	168,400	29.00	238,600
5.70	37,830	13.50	100,150	21.30	169,300	29.10	239,500
5.80	38,520	13.60	101,020	21.40	170,200	29.20	240,400
5.90	39,210	13.70	101,890	21.50	171,100	29.30	241,300
6.00	39,900	13.80	102,760	21.60	172,000	29.40	242,200
6.10	40,600	13.90	103,630	21.70	172,900	29.50	243,100
6.20	41,300	14.00	104,500	21.80	173,800	29.60	244,000
6.30	42,000	14.10	105,370	21.90	174,700	29.70	244,900
6.40	42,700	14.20	106,240	22.00	175,600	29.80	245,800
6.50	43,400	13.30	107,110	22.10	176,500	29.90	246,700
6.60	44,110	14.40	107,980	22.20	177,400	30.00	247,600
6.70	44,820	14.50	108,850	22.30	178,300	30.10	248,500

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Discharge rating table for Tennessee River at Johnsonville, Tenn., from Oct. 1, 1889, to Sept. 30, 1913—Continued.

Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
Feet.	*Sec.-feet.*	*Feet.*	*Sec.-feet.*	*Feet.*	*Sec.-feet.*	*Feet.*	*Sec.-feet.*
30.20	249,400	35.20	294,400	40.20	339,400	45.20	384,400
30.30	250,300	35.30	295,300	40.30	340,300	45.30	385,300
30.40	251,200	35.40	296,200	40.40	341,200	45.40	386,200
30.50	252,100	35.50	297,100	40.50	342,100	45.50	387,100
30.60	253,000	35.60	298,000	40.60	343,000	45.60	388,000
30.70	253,900	35.70	298,900	40.70	343,900	45.70	388,900
30.80	254,800	35.80	299,800	40.80	344,800	45.80	389,800
30.90	255,700	35.90	300,700	40.90	345,700	45.90	390,700
31.00	256,600	36.00	301,600	41.00	346,600	46.00	391,600
31.10	257,500	36.10	302,500	41.10	347,500	46.10	392,500
31.20	258,400	36.20	303,400	41.20	348,400	46.20	393,400
31.30	259,300	36.30	304,300	41.30	349,300	46.30	394,300
31.40	260,200	36.40	305,200	41.40	350,200	46.40	395,200
31.50	261,100	36.50	306,100	41.50	351,100	46.50	396,100
31.60	262,000	36.60	307,000	41.60	352,000	46.60	397,000
31.70	262,900	36.70	307,900	41.70	352,900	46.70	397,900
31.80	263,800	36.80	308,800	41.80	353,800	46.80	398,800
31.90	264,700	36.90	309,700	41.90	354,700	46.90	399,700
32.00	265,600	37.00	310,600	42.00	355,600	47.00	400,600
32.10	266,500	37.10	311,500	42.10	356,500	47.10	401,500
32.20	267,400	37.20	312,400	42.20	357,400	47.20	402,400
32.30	268,300	37.30	313,300	42.30	358,300	47.30	403,300
32.40	269,200	37.40	314,200	42.40	359,200	47.40	404,200
32.50	270,100	37.50	315,100	42.50	360,100	47.50	405,100
32.60	271,000	37.60	316,000	42.60	361,000	47.60	406,000
32.70	271,900	37.70	316,900	42.70	361,900	47.70	406,900
32.80	272,800	37.80	317,800	42.80	362,800	47.80	407,800
32.90	273,700	37.90	318,700	42.90	363,700	47.90	408,700
33.00	274,600	38.00	319,600	43.00	364,600	48.00	409,600
33.10	275,500	38.10	320,500	43.10	365,500	48.10	410,500
33.20	276,400	38.20	321,400	43.20	366,400	48.20	411,400
33.30	277,300	38.30	322,300	43.30	367,300	48.30	412,300
33.40	278,200	38.40	323,200	43.40	368,200	48.40	413,200
33.50	279,100	38.50	324,100	43.50	369,100	48.50	414,100
33.60	280,000	38.60	325,000	43.60	370,000	48.60	415,000
33.70	280,900	38.70	325,900	43.70	370,900	48.70	415,900
33.80	281,800	38.80	326,800	43.80	371,800	48.80	416,800
33.90	282,700	38.90	327,700	43.90	372,700	48.90	417,700
34.00	283,600	39.00	328,600	44.00	373,600	49.00	418,600
34.10	284,500	39.10	329,500	44.10	374,500	50.00	427,600
34.20	285,400	39.20	330,400	44.20	375,400	51.00	436,600
34.30	286,300	39.30	331,300	44.30	376,300	52.00	445,600
34.40	287,200	39.40	332,200	44.40	377,200	53.00	454,600
34.50	288,100	39.50	333,100	44.50	378,100	54.00	463,600
34.60	289,000	39.60	334,000	44.60	379,000	55.00	472,600
34.70	289,900	39.70	334,900	44.70	379,900	56.00	481,600
34.80	290,800	39.80	335,800	44.80	380,800	57.00	490,600
34.90	291,700	39.90	336,700	44.90	381,700	58.00	499,600
35.00	292,600	40.00	337,600	45.00	382,600	59.00	508,600
35.10	293,500	40.10	338,500	45.10	383,500	60.00	517,600

NOTE.—The above table is not applicable for periods during which ice was present or channel was obstructed. It is based on seven discharge measurements made during 1910–11 by the United States Geological Survey, and four values of discharge computed from 41 discharge measurements made during September, 1903, by the United States Engineer Corps at Birmingham, Ky., as noted under "Discharge measurements" in the station description. The rating table is well defined between discharges 9,370 and 202,000 second-feet (gage heights 0.0 and 36.0 feet). Use this table to three significant figures only. See "Discharge measurements" and "Backwater" in station description.

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Daily gage height, in feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1876–1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1876.												
1	4.7	1.0	9.4	25.9	19.5	8.9	21.7	6.7	8.8	7.2	4.4	1.0
2	4.2	1.0	8.6	26.9	19.1	8.3	22.9	8.2	9.9	7.0	3.8	1.8
3	3.8	1.0	8.1	27.6	20.5	7.8	24.5	12.6	10.0	6.2	3.2	2.0
4	3.8	1.0	7.6	28.2	21.0	7.4	25.6	16.8	9.3	6.2	3.2	1.9
5	3.8	1.4	7.2	28.7	21.8	6.8	25.8	18.8	8.5	6.0	3.7	1.6
6	3.6	1.8	7.1	29.0	21.8	6.4	25.4	19.6	7.9	6.1	5.8	1.5
7	3.5	2.3	7.8	28.9	21.5	6.5	24.2	20.8	7.4	6.7	6.1	1.5
8	3.3	2.8	10.2	28.7	20.5	6.9	22.0	21.9	7.2	7.2	6.2	1.4
9	2.2	3.1	11.8	26.9	19.2	6.9	21.1	22.6	7.2	7.2	5.2	1.4
10	2.2	3.5	12.8	23.1	17.8	6.8	15.8	22.2	10.6	7.1	5.6	1.2
11	2.5	4.4	12.7	17.5	16.1	6.5	13.1	21.4	7.3	6.8	5.8	1.2
12	3.2	5.4	11.9	13.1	15.1	8.7	11.1	21.0	7.0	6.6	5.6	1.0
13	4.2	6.2	10.2	10.3	15.1	11.6	11.0	20.9	6.4	6.2	5.2	1.0
14	3.7	6.5	10.4	8.8	15.4	12.5	13.5	20.5	6.2	6.0	6.1	1.0
15	3.1	6.9	9.7	7.8	15.8	11.6	13.0	19.6	14.7	5.8	5.8	1.0
16	.....	7.8	8.8	5.5	17.5	12.5	13.0	17.6	24.6	5.0	5.2	1.0
17	2.4	8.4	8.0	10.3	18.0	14.5	12.4	14.9	22.9	4.8	4.5	1.0
18	2.2	8.3	7.3	14.1	19.4	18.1	12.6	12.4	18.5	4.6	4.0	1.0
19	2.1	7.8	6.3	17.0	19.1	20.7	13.3	10.6	13.3	4.2	3.6	.9
20	1.8	7.4	6.0	18.7	19.8	22.0	13.5	10.1	10.7	4.2	3.1	1.1
21	1.7	7.0	5.4	18.3	20.3	22.8	13.9	10.0	12.9	4.1	3.2	2.0
22	1.6	6.7	5.1	16.7	20.0	23.0	11.9	8.4	15.2	4.2	3.2	2.9
23	1.6	6.3	4.8	16.3	18.8	21.8	9.9	7.8	17.0	4.0	3.0	1.8
24	1.5	7.5	6.2	16.8	16.3	21.4	9.9	7.5	17.5	4.0	2.3	1.2
25	1.4	8.1	8.0	16.9	14.1	21.2	8.9	7.3	16.3	3.9	2.7	.8
26	1.3	8.8	9.7	17.6	12.6	22.4	8.2	7.0	13.4	3.8	2.2	.8
27	1.3	10.6	16.0	16.5	11.4	22.6	7.5	6.8	10.6	3.8	2.2	1.1
28	1.2	10.3	17.2	16.0	10.4	22.6	7.0	.....	8.8	3.7	2.0	1.1
29	1.2	10.2	18.8	16.8	9.7	22.5	6.7	6.8	7.7	3.7	1.9	1.0
30	1.1	9.9	21.4	18.4	.....	22.4	6.2	7.0	7.4	4.5	1.8	1.0
31	1.1	.....	24.0	19.5	.....	22.1	.....	7.3	.....	5.3	1.4	.....
1877.												
1	.9	1.3	1.8	1.5	14.5	2.7	.....	.....	.....	3.3	3.5	.....
2	1.0	1.1	1.8	1.5	9.3	2.0	.....	.....	.....	3.3	3.0	.....
3	1.4	.9	1.4	1.6	8.0	2.0	.....	.....	.....	3.1	2.8	.....
4	1.3	.8	1.2	1.5	7.5	2.0	.....	.....	.....	2.8	2.6	.....
5	1.2	.7	1.1	1.5	8.2	3.0	.....	.....	.....	2.5	2.4	.....
6	1.2	.6	1.1	1.7	9.9	3.7	.....	.....	.....	2.3	2.1	.....
7	1.0	.5	1.1	1.8	10.8	4.5	.....	.....	.....	2.7	1.9	.....
8	.8	.4	1.0	2.0	9.2	4.7	.....	.....	.....	2.7	1.8	.....
9	.8	.3	.8	1.2	8.9	6.8	.....	.....	.....	2.2	1.7	.....
10	.8	.3	.8	1.8	8.2	7.7	.....	.....	.....	2.1	1.6	.....
11	.4	.3	.8	2.5	7.5	.....	.....	.....	.....	2.0	1.6	.....
12	.4	.2	.7	3.7	6.5	.....	.....	.....	.....	2.0	1.5	.....
13	.3	.2	.6	5.2	6.0	.....	.....	.....	.....	1.5	1.4	.....
14	.2	.2	.6	.....	5.5	.....	.....	.....	.....	1.5	1.2	.....
15	.2	.2	.5	.....	5.0	.....	.....	.....	.....	.....	1.1	.....
16	.2	.2	.4	.....	4.7	.....	.....	.....	.....	.....	1.0	.....
17	.2	.1	.3	.....	4.3	.....	.....	.....	.....	.....	.9	.....
18	.1	.1	.2	.....	4.0	.....	.....	.....	.....	.....	.9	.....
19	.0	.2	.2	.....	3.8	.....	.....	.....	.....	.....	.....	.....
20	− .1	.3	.1	.....	3.8	.....	.....	.....	.....	.....	.....	.....
21	− .1	.2	.3	21.3	3.5	.....	.....	.....	.....	.....	.....	.....
22	+ .2	.0	.6	22.7	3.2	.....	.....	.....	.....	.....	.....	.....
23	.3	.1	.8	24.2	3.0	.....	.....	.....	.....	.....	.....	.....
24	.9	.1	.8	24.7	3.0	.....	.....	.....	.....	.....	.....	.....
25	1.2	.1	.8	24.6	3.0	.....	.....	.....	.....	.....	.....	.....
26	1.0	.2	.8	24.2	3.0	.....	.....	.....	.....	.....	.....	.....
27	.9	.4	.8	24.5	2.8	.....	.....	.....	.....	.....	.....	.....
28	.8	.6	.8	24.4	2.7	.....	.....	.....	.....	.....	.....	.....
29	.7	.9	1.0	23.1	.....	.....	.....	.....	.....	.....	.....	.....
30	1.2	1.4	1.2	22.5	.....	.....	.....	.....	.....	.....	.....	.....
31	1.5	.....	1.3	18.9	.....	.....	.....	.....	.....	.....	.....	.....

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Daily gage height, in feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1876–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1879.[a]												
1						18.9	13.5	6.0	2.0	0.6	1.5	2.8
2						16.8	12.3	6.0	1.9	.7	1.1	4.2
3						14.8	11.8	6.1	2.3	.8	.9	5.2
4						12.8	11.2	6.2	2.8	.8	1.2	6.0
5						10.8	10.5	6.5	3.2	.8	2.3	6.2
6						9.1	10.2	7.0	3.5	.8	3.3	6.5
7						8.0	10.0	7.6	3.7	.8	3.9	6.5
8						7.0	9.7	8.2	3.5	.7	4.2	5.8
9						6.3	9.2	8.8	3.3	.8	4.2	4.7
10						6.0	8.7	8.8	3.1	.9	4.3	3.5
11						6.2	8.3	8.5	2.8	.8	4.0	3.0
12						6.0	8.2	7.5	2.7	.7	3.5	2.7
13						5.9	8.0	7.0	2.4	.6	2.9	2.4
14						5.8	8.0	6.8	2.2	.5	2.6	2.1
15						5.8	8.0	6.8	2.1	.7	2.3	2.0
16						5.7	7.9	6.7	2.0	1.0	2.1	2.0
17						5.7	7.8	6.6	1.9	1.2	2.0	1.9
18						5.8	7.8	6.5	1.8	1.0	1.9	1.9
19						6.9	7.6	6.2	1.8	.8	1.8	1.8
20						8.6	7.4	6.0	1.7	.8	1.8	1.8
21						9.5	7.2	5.7	1.6	.7	1.7	1.8
22						10.3	7.1	5.3	1.6	.6	1.7	1.6
23						10.2	6.8	5.1	1.4	.5	1.6	1.2
24						11.8	6.7	4.9	1.2	.5	1.7	.8
25						12.4	6.5	4.3	1.0	.5	2.0	.7
26						12.8	6.3	3.7	.8	.5	2.7	.3
27						13.2	6.2	3.1	.7	.8	2.8	.0
28						13.5	6.1	2.8	.5	1.3	2.6	.0
29						13.7	6.0	2.5	.5	1.8	2.3	.0
30						13.8	6.0	2.3	.5	2.1	2.0	.0
31						13.8	.....	2.2	.....	1.8	1.8	.....
1880.												
1	0.0	3.0	4.6	27.0	6.5	22.5	21.5	18.7	7.0	3.2	1.2	4.5
2	.1	2.5	4.5	23.3	9.2	23.0	18.2	18.9	7.2	3.2	.9	4.6
3	.2	2.1	4.5	18.3	12.2	22.0	14.0	19.0	7.5	3.1	.8	4.6
4	.3	1.9	4.4	14.5	14.5	20.5	13.5	19.0	7.7	3.4	.5	4.5
5	1.0	1.8	6.2	12.5	15.4	20.5	13.0	18.8	7.8	3.9	.2	4.3
6	1.7	1.7	9.2	10.7	14.8	21.3	16.2	18.0	7.8	4.4	.1	4.2
7	2.8	1.6	12.0	10.0	12.0	23.3	19.2	17.0	7.9	5.0	.0	4.0
8	3.2	1.5	15.0	10.3	10.0	25.0	22.5	16.0	7.8	5.3	.0	3.8
9	3.1	1.5	17.5	11.7	9.8	26.7	26.0	14.7	7.1	5.7	.3	3.6
10	3.8	1.4	19.4	.....	13.2	28.2	25.4	13.2	6.5	6.0	.8	3.4
11	4.9	1.4	20.8	13.7	16.8	29.3	24.5	11.7	5.9	6.0	1.1	3.2
12	6.1	1.3	20.9	18.0	19.0	30.2	22.0	10.2	5.4	5.1	1.4	2.8
13	8.0	1.3	22.5	22.2	22.0	31.0	20.0	9.0	5.0	4.2	1.8	2.6
14	9.5	2.0	24.2	23.0	24.0	31.8	18.0	8.2	4.6	3.5	2.2	2.3
15	10.3	3.2	25.3	21.0	24.8	32.6	16.0	7.6	4.2	3.0	2.5	2.2
16	10.7	4.9	26.0	18.5	24.9	33.4	14.2	7.3	4.0	2.5	2.8	2.2
17	10.9	6.8	26.5	16.0	24.4	34.2	12.6	7.2	3.8	2.0	3.0	2.4
18	11.3	8.8	26.9	14.7	23.0	35.2	12.0	7.0	3.7	1.7	3.2	2.8
19	11.8	9.9	27.2	13.0	21.5	36.2	12.2	6.8	3.5	1.4	3.5	3.2
20	12.2	10.8	27.5	12.2	21.8	37.0	12.8	6.7	3.3	1.3	3.7	3.5
21	12.3	10.9	27.0	11.4	22.4	37.5	13.8	6.5	3.2	1.2	3.8	3.7
22	12.5	10.7	26.2	11.0	23.0	37.7	14.8	6.3	3.0	1.2	3.8	3.8
23	12.0	10.0	25.7	10.5	22.5	37.7	15.7	6.1	2.8	1.1	3.8	3.9
24	11.5	9.0	25.7	10.0	20.0	37.5	15.7	5.8	2.7	1.0	3.8	4.0
25	10.5	8.2	25.9	9.4	17.2	37.3	.....	5.6	2.6	1.9	3.7	4.0
26	9.2	7.0	26.5	8.8	16.8	37.2	.....	5.3	2.5	1.8	3.6	3.8
27	7.7	6.3	26.2	8.1	17.9	37.2	.....	5.3	2.4	1.8	3.7	3.4
28	6.0	5.8	26.9	7.4	19.0	35.0	.....	5.7	2.3	1.7	3.8	3.1
29	4.3	5.2	27.5	6.9	20.5	32.0	.....	6.0	2.3	1.6	3.9	2.9
30	3.8	4.8	27.7	6.4	.....	29.0	.....	6.3	2.2	1.5	4.2	2.7
31	3.3	.....	27.7	6.0	.....	25.5	.....	6.7	.....	1.4	4.4	.....

[a] No record during the year ending Sept. 30, 1878.

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Daily gage height, in feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1876–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1881.												
1	2.5											
2	2.2											
3	2.1											
4	2.0											
5	2.2											
6	2.7											
7	2.8											
8	2.6											
9	2.4											
10	2.2											
11	2.0											
12	1.8											
13	1.8											
14	1.8											
15	2.0											
16	2.2											
17	2.4											
18	2.5											
19	2.6											
20	2.7											
21	2.8											
22	2.9											
23	3.0											
24	3.0											
25	2.8											
26	2.7											
27	2.4											
28	2.4											
29	2.6											
30	2.8											
31	3.2											
1882.												
1				19.3	43.5	25.7	19.8	11.4	8.8	6.2	3.7	
2				20.3	43.8	26.3	19.5	10.0	10.0	6.7	3.7	
3				21.3	42.6	27.1	19.0	9.0	10.8	7.2	3.6	3.1
4				22.2	40.1	27.6	18.3	8.0	10.4	7.2	3.5	3.3
5				23.0	39.0	27.8	17.2	7.8	9.0	7.4	3.3	3.3
6				23.8	40.6	28.4	16.1	10.6	9.9	7.6	3.3	3.2
7				24.4	40.7	28.8	15.0	13.0	10.8	7.7	3.4	3.2
8				25.1	39.2	29.1	14.2	16.8	9.8	7.8	3.6	3.1
9				25.7	38.5	29.4	10.4	19.0	8.8	7.7	3.7	2.8
10				26.0	37.8	29.2	12.8	22.0	8.3	7.3	3.8	2.8
11				26.0	37.1	28.4	12.2	20.0	7.8	7.0	3.8	2.8
12				26.2	36.4	27.7	11.8	18.0	7.5	6.7	3.8	2.8
13				26.8	35.8	26.8	11.2	17.5	7.1	6.4	3.7	3.0
14				28.0	34.3	25.0	10.8	17.3	6.7	6.3	3.7	3.2
15				29.4	33.2	24.3	10.4	16.3	6.3	6.2	3.7	3.3
16				30.8	32.1	23.7	10.2	15.0	5.8	6.0	3.7	11.9
17				32.6	31.1	23.0	10.0	12.8	5.7	5.8	3.8	15.3
18				34.0	30.0	22.3	9.8	10.5	5.8	5.7	3.8	17.0
19				35.2	30.8	21.8	8.7	10.0	5.9	5.4	3.8	18.0
20				36.5	29.0	21.2	7.6	9.4	6.0	5.1	3.9	18.8
21				37.7	28.3	20.6	7.6	8.4	5.9	5.1	4.0	19.2
22				38.7	27.8	20.0	8.0	8.0	5.9	5.0	4.1	19.5
23				39.7	27.2	19.5	9.8	9.8	5.8	4.9	4.2	19.8
24				40.5	26.7	19.0	11.8	9.8	5.9	4.8	4.2	19.9
25				41.3	26.2	19.4	13.0	8.8	5.9	4.4	4.2	19.9
26				42.1	25.7	20.8	13.2	7.7	5.8	4.1	4.1	19.7
27				42.8	25.2	20.4	12.9	6.4	5.8	3.7	3.0	19.3
28				43.0	25.0	20.8	12.7	7.0	5.7	3.3	3.1	18.8
29				43.2		20.9	12.3	7.5	5.8	3.2	3.2	18.6
30				43.5		21.3	11.9	8.0	5.8	3.0	3.3	18.3
31				43.8		21.3		8.0		2.8	3.5	

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Daily gage height, in feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1876–1915—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1883.												
1	18.0	9.4	0.2	3.5	28.8	23.2	19.2	.....	.....	.....	.....	.....
2	17.3	9.2	.2	3.7	29.0	23.3	19.4	.....	.....	.....	.....	.....
3	17.0	8.8	.3	4.0	29.0	23.4	19.7	.....	.....	.....	.....	.....
4	16.0	8.6	.4	4.3	28.8	23.4	19.8	.....	.....	.....	.....	.....
5	14.2	8.3	.6	4.8	28.5	23.3	20.2	.....	.....	.....	.....	.....
6	13.1	7.8	.8	5.3	28.3	23.2	20.0	.....	.....	.....	.....	.....
7	11.0	7.3	.9	5.7	28.0	22.9	20.8	.....	.....	.....	.....	.....
8	10.4	6.3	1.0	6.1	27.7	22.7	21.2	.....	.....	.....	.....	.....
9	10.0	6.3	1.3	6.8	27.3	22.5	21.6	.....	.....	.....	.....	.....
10	8.0	5.6	1.6	7.5	27.0	22.0	21.9	.....	.....	.....	.....	.....
11	8.0	4.3	2.0	8.0	26.6	21.6	22.3	.....	.....	.....	.....	.....
12	8.0	3.4	2.5	8.8	26.2	21.1	22.8	.....	.....	.....	.....	.....
13	6.0	2.8	3.0	10.2	25.7	20.5	23.2	.....	.....	.....	.....	.....
14	5.2	2.6	3.3	11.2	25.3	20.0	23.8	.....	.....	.....	.....	.....
15	5.0	2.2	3.9	12.0	24.9	19.5	24.3	.....	.....	.....	.....	.....
16	3.1	1.8	4.2	12.8	24.6	19.1	24.7	.....	.....	.....	.....	.....
17	3.2	1.3	4.8	13.2	24.2	18.8	25.2	.....	.....	.....	.....	.....
18	3.7	1.0	5.0	14.2	23.9	18.5	25.4	.....	.....	.....	.....	.....
19	4.5	.7	5.2	15.2	23.8	18.3	25.7	.....	.....	.....	.....	.....
20	5.1	.3	5.2	16.3	23.3	18.2	25.9	.....	.....	.....	.....	.....
21	6.1	.2	5.2	17.0	23.0	18.0	26.2	.....	.....	.....	.....	.....
22	6.1	.2	5.2	21.0	22.8	17.9	26.3	.....	.....	.....	.....	.....
23	6.1	.2	5.2	24.0	22.7	17.9	26.6	.....	.....	.....	.....	.....
24	6.1	.1	5.1	25.0	22.6	18.0	26.7	.....	.....	.....	.....	.....
25	5.7	.1	4.9	26.0	22.6	18.1	26.8	.....	.....	.....	.....	.....
26	5.4	.0	4.8	26.8	22.7	18.2	26.8	.....	.....	.....	.....	.....
27	5.1	.0	4.3	27.2	22.8	18.4	26.7	.....	.....	.....	.....	.....
28	5.8	.0	3.8	27.8	23.0	18.7	26.6	.....	.....	.....	.....	.....
29	6.2	.1	3.8	28.0	.....	18.8	26.5	.....	.....	.....	.....	.....
30	7.7	.1	3.7	28.5	.....	19.0	26.3	.....	.....	.....	.....	.....
31	9.6	.....	3.6	28.7	.....	19.2	.....	.....	.....	.....	.....	.....
1884.												
1	.....	.....	.....	.....	.....	44.2	42.3	25.2	2.8	5.1	1.6	−0.1
2	.....	.....	.....	.....	.....	44.0	42.7	24.3	2.7	5.1	1.2	.0
3	.....	.....	.....	.....	.....	43.8	43.0	23.5	2.6	5.2	1.0	.0
4	.....	.....	.....	.....	.....	43.5	43.2	22.7	2.5	5.2	.8	.0
5	.....	.....	.....	.....	36.4	43.2	43.4	21.8	2.4	5.3	.7	.1
6	.....	.....	.....	.....	36.6	42.8	43.6	20.0	2.2	5.4	.5	.1
7	.....	.....	.....	.....	36.8	42.2	43.7	19.2	2.2	5.5	.5	.2
8	.....	.....	.....	.....	37.0	41.7	43.7	18.3	2.0	5.5	.3	.0
9	.....	.....	.....	.....	37.2	41.1	43.7	17.5	2.1	5.5	.3	.0
10	.....	.....	.....	.....	37.5	40.7	43.5	16.7	2.0	5.5	.2	.0
11	.....	.....	.....	.....	37.8	40.0	43.2	15.7	2.0	5.5	.2	.0
12	.....	.....	.....	.....	38.2	39.3	42.8	14.7	2.1	5.5	.2	.0
13	.....	.....	.....	.....	38.6	38.8	42.2	13.6	2.2	5.0	.1	.2
14	.....	.....	.....	.....	38.9	38.3	41.6	12.8	2.3	5.3	.1	.0
15	.....	.....	.....	.....	39.2	38.0	41.0	11.0	2.5	5.2	.0	.0
16	.....	.....	.....	.....	39.8	37.8	40.1	10.2	2.7	5.0	.0	.0
17	.....	.....	.....	.....	40.2	37.5	39.0	9.3	2.9	4.8	.0	.2
18	.....	.....	.....	.....	40.8	37.4	38.0	8.6	3.3	4.5	.1	.1
19	.....	.....	.....	.....	41.4	37.4	37.2	7.8	3.6	4.3	.1	.0
20	.....	.....	.....	.....	41.9	37.5	36.2	7.2	4.0	4.2	.2	.0
21	.....	.....	.....	.....	42.3	37.5	35.2	6.7	4.2	4.0	.4	.0
22	.....	.....	.....	.....	42.8	37.7	34.4	6.0	4.3	3.8	.5	.0
23	.....	.....	.....	.....	43.2	37.9	33.3	5.7	4.5	3.7	.5	.0
24	.....	.....	.....	.....	43.6	38.2	32.2	5.3	4.6	3.5	.6	.0
25	.....	.....	.....	.....	43.8	38.8	31.4	5.0	4.7	3.2	.6	.0
26	.....	.....	.....	.....	44.1	39.8	30.4	4.6	4.8	3.1	.5	.0
27	.....	.....	.....	.....	44.2	40.2	29.6	4.2	4.8	2.8	.4	.2
28	.....	.....	.....	.....	44.4	40.6	28.8	3.9	4.8	2.6	.2	.2
29	.....	.....	.....	.....	44.3	41.0	27.0	3.6	4.9	2.3	.1	.2
30	.....	.....	.....	.....	.....	41.5	26.2	3.2	5.0	2.1	−.1	.0
31	.....	.....	.....	.....	.....	42.0	.....	3.0	.....	1.8	−.1	.....

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Daily gage height, in feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1876–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1885.												
1	0.0	0.3	.....	1.8	19.4	9.0	6.4	10.0	13.4	1.8	2.4	2.3
2	.0	.3	.....	2.2	17.4	9.3	6.2	9.0	13.7	1.7	2.4	2.2
3	.2	.4	.....	2.5	14.0	9.9	6.0	8.0	13.8	1.7	2.4	2.1
4	.2	.5	.....	2.8	12.0	10.0	5.9	7.5	13.8	1.6	2.4	2.1
5	.0	.5	.....	3.0	10.0	10.1	5.7	7.0	13.8	1.6	2.4	2.0
6	.0	.6	.....	3.3	9.6	10.2	5.9	6.8	13.7	1.5	2.3	2.0
7	.0	.6	.....	3.8	8.3	10.2	6.2	6.4	13.5	1.5	2.3	1.9
8	.0	.7	.....	4.3	7.0	10.2	7.0	6.2	13.0	1.5	2.3	1.8
9	.0	.8	.....	5.5	6.8	10.1	8.0	6.0	12.5	1.4	2.0	2.1
10	.1	.8	.....	6.5	6.2	10.0	8.5	5.7	11.5	1.4	2.4	2.2
11	.1	.9	.....	8.5	5.8	9.9	8.3	5.3	11.0	1.8	2.2	2.2
12	.1	.9	.....	11.7	5.4	9.7	8.5	4.8	10.2	2.6	2.2	2.2
13	.0	.9	.....	13.5	5.0	9.6	8.0	4.4	9.5	3.2	2.2	2.2
14	.0	.8	.....	15.5	4.9	9.6	7.7	4.0	9.0	3.8	2.1	2.2
15	.0	.8	.....	17.4	4.8	9.7	6.6	3.9	8.2	4.0	2.2	2.3
16	.1	.7	.....	20.3	4.6	9.9	6.0	3.7	7.2	4.0	2.4	2.3
17	.2	.6	.....	24.3	4.5	10.1	5.0	3.5	6.4	3.8	2.7	2.3
18	.2	.5	.....	26.3	4.5	10.3	4.0	3.4	5.5	3.6	2.9	2.4
19	.2	.5	.....	28.0	4.5	10.3	4.3	3.4	4.6	3.4	2.9	2.2
20	.3	.4	.....	29.0	4.6	10.0	4.7	3.8	4.0	3.2	2.8	1.9
21	.3	.4	.....	29.5	4.7	9.8	5.0	4.5	3.7	3.0	2.6	1.6
22	.3	.2	.....	29.9	4.9	9.6	5.4	5.5	3.5	3.0	2.5	1.6
23	.0	.2	.....	30.0	5.0	9.3	5.6	6.4	3.4	2.9	2.5	1.5
24	.0	.2	.....	29.8	5.6	9.0	7.7	7.9	3.2	2.8	2.5	1.5
25	.0	.3	.....	28.0	6.1	9.0	12.0	8.5	3.0	2.8	2.4	1.5
26	.0	.3	.....	27.0	7.0	9.0	13.6	8.9	2.7	2.7	2.4	1.4
27	.3	.4	.....	26.0	7.7	8.1	15.4	9.9	2.5	2.6	2.5	1.4
28	.2	.4	.....	25.0	8.4	7.6	15.0	10.6	2.4	2.6	2.6	1.8
29	.0	.4	.....	24.2	.....	7.0	14.0	11.0	2.1	2.5	2.6	1.9
30	.0	.2	.....	23.3	.....	6.9	12.6	12.5	1.9	2.5	2.5	2.0
31	.0	.....	.....	21.3	.....	6.7	.....	13.0	.....	2.4	2.4	.....
1886.												
1	3.2	2.8	5.5	6.0	17.5	10.6	26.9	7.2	9.0	12.0	4.0	3.0
2	3.3	4.1	5.4	5.9	17.5	10.8	28.9	6.9	8.7	10.9	4.2	2.9
3	3.4	9.2	5.3	8.0	16.7	11.9	31.0	6.8	9.3	10.3	4.5	2.8
4	3.0	11.0	5.2	12.0	14.0	12.3	32.3	6.6	9.9	10.0	4.8	2.8
5	3.6	13.0	5.1	16.0	13.0	12.3	33.2	6.2	10.1	9.3	4.5	2.9
6	5.8	12.2	5.0	20.0	11.9	11.3	34.1	5.9	8.9	9.9	3.8	3.5
7	6.4	11.3	4.9	24.4	11.0	10.0	35.3	6.9	7.9	10.3	3.5	3.9
8	5.8	11.3	4.7	24.8	10.4	9.5	36.2	12.1	7.7	12.0	4.7	3.2
9	5.0	14.6	5.8	25.0	10.0	8.5	37.6	14.8	7.5	12.0	6.1	2.9
10	4.7	17.8	6.8	25.1	9.6	8.3	38.7	14.7	8.2	11.2	5.4	2.8
11	3.8	18.6	8.6	24.8	12.8	7.4	39.8	13.4	6.4	12.4	4.9	2.4
12	3.2	20.1	9.6	22.9	20.4	6.9	40.7	13.5	9.5	12.7	5.6	2.1
13	2.8	22.0	10.6	20.0	21.4	6.7	41.4	13.9	10.4	12.3	5.3	2.0
14	2.2	22.8	11.9	17.3	20.0	6.2	41.8	14.3	11.5	11.5	4.6	2.2
15	2.0	23.0	12.5	15.1	17.8	6.2	42.1	14.7	13.4	10.6	4.3	2.1
16	1.8	22.7	13.8	12.0	17.4	6.2	42.1	15.1	14.0	9.5	4.2	2.4
17	1.7	21.0	15.2	10.5	17.0	6.0	41.9	13.2	14.4	9.6	4.0	5.0
18	2.7	16.5	16.0	10.3	16.6	5.5	41.2	10.5	15.3	9.9	4.0	5.5
19	2.1	12.5	18.0	12.1	15.5	5.8	40.1	8.4	17.1	9.1	3.6	5.6
20	3.7	10.2	18.6	14.7	15.4	6.0	38.1	9.0	16.1	8.3	3.2	4.0
21	4.2	8.8	18.8	15.4	12.9	5.9	35.5	8.0	15.4	7.5	3.1	3.6
22	3.9	8.1	16.6	16.0	12.3	6.9	31.8	8.5	18.8	7.0	3.0	2.9
23	3.4	7.4	15.9	16.7	10.5	6.9	28.6	8.2	19.6	6.7	2.9	2.2
24	3.1	6.4	13.9	16.7	9.5	8.8	20.7	9.1	16.6	6.2	3.5	2.2
25	2.9	6.2	10.2	16.3	9.0	11.2	15.4	9.1	16.6	6.0	5.0	2.0
26	2.7	6.1	8.1	16.5	8.8	12.4	11.8	9.9	17.4	5.6	4.2	2.0
27	2.8	6.0	7.8	17.2	9.8	14.0	9.4	9.8	16.1	5.2	4.1	1.9
28	2.5	5.9	7.0	18.2	10.2	15.2	8.8	9.3	15.7	4.9	4.1	1.8
29	2.3	5.8	6.7	18.7	.....	16.0	8.0	9.0	15.1	4.8	3.8	1.7
30	2.5	5.6	6.6	19.8	.....	18.5	7.5	9.4	14.3	4.3	3.7	1.7
31	2.5	.....	6.2	18.6	.....	22.0	.....	9.1	.....	4.0	3.3	.....

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Daily gage height, in feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1876–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1887.												
1	1.6	0.1	12.3	11.5	27.8	31.3	6.6	14.8	10.6	3.2	3.3	3.2
2	1.5	.1	11.8	12.4	27.4	31.0	6.9	14.9	10.8	3.9	3.3	3.3
3	1.3	.2	10.3	11.0	27.3	30.6	7.0	14.7	10.9	3.9	2.9	3.4
4	1.2	.7	8.8	9.9	27.2	29.5	7.4	14.1	11.0	3.0	2.4	3.8
5	1.1	1.0	8.2	9.3	26.5	29.6	8.0	13.8	11.4	2.8	2.7	3.9
6	1.4	1.1	7.8	9.8	26.0	29.4	8.3	13.2	11.7	2.4	3.0	4.0
7	1.5	1.3	7.0	10.0	25.3	30.5	8.0	12.1	12.0	2.3	3.0	3.2
8	1.4	1.1	6.7	9.5	24.9	30.4	7.7	11.6	12.4	2.0	3.8	3.0
9	1.3	.9	5.5	9.0	22.9	30.1	7.5	11.0	12.4	2.6	4.6	2.7
10	1.1	.9	5.5	8.4	22.9	30.0	7.4	10.5	11.9	3.1	5.1	2.6
11	1.0	1.2	4.7	8.3	22.8	29.0	7.2	10.2	10.8	3.5	4.9	2.5
12	1.0	1.3	4.3	8.0	22.1	28.2	7.0	9.5	10.0	3.8	4.6	2.1
13	.9	1.4	4.2	7.7	21.0	26.6	7.0	9.0	9.5	3.9	4.1	1.9
14	.9	1.5	4.9	6.5	20.1	25.1	7.0	9.0	8.7	3.7	3.7	1.8
15	.8	1.5	5.2	6.2	19.9	24.0	6.8	9.1	8.2	3.5	2.9	1.4
16	.8	1.5	6.0	5.9	19.9	23.9	6.7	9.4	8.1	3.1	2.8	1.0
17	.7	1.6	7.0	8.1	19.1	22.7	6.4	9.6	8.1	3.0	2.6	1.0
18	.7	1.7	8.8	7.0	20.6	21.0	6.2	9.6	8.1	2.7	2.3	.9
19	.7	1.8	9.1	7.5	21.1	20.8	6.0	9.6	8.1	2.3	2.1	.8
20	.6	3.0	9.9	8.0	21.3	19.0	5.9	9.4	7.0	2.0	2.0	.9
21	.5	3.8	13.3	7.7	21.5	18.5	5.8	9.0	5.0	2.1	2.0	.7
22	.5	3.9	13.2	7.4	22.1	16.1	5.5	8.6	4.0	2.0	2.0	.6
23	.4	6.5	12.6	8.8	23.0	15.3	5.1	8.3	3.4	1.9	1.9	.5
24	.4	11.0	14.5	11.8	23.9	13.9	6.1	8.2	3.1	1.1	1.9	.5
25	.4	10.8	14.1	13.0	27.1	11.4	6.9	8.0	2.8	1.1	1.8	.4
26	.3	10.4	12.0	14.2	29.7	9.0	7.9	7.9	2.8	1.1	2.1	.1
27	.3	10.7	10.7	19.1	30.8	8.8	8.2	7.5	2.4	1.0	2.3	.4
28	.2	11.8	10.0	20.7	31.4	8.0	10.0	6.8	2.4	.9	3.0	.3
29	.2	12.0	9.4	24.2	.....	7.6	12.9	6.5	2.4	1.6	3.2	.6
30	.1	12.0	9.7	25.4	.....	6.6	14.1	6.3	2.8	2.6	3.4	1.0
31	.1	.....	11.0	27.3	.....	5.5	.....	6.2	.....	2.9	2.4	.....
1888.												
1	1.0	2.0	1.5	4.6	10.3	14.7	33.3	5.0	8.0	5.0	1.0	4.7
2	.8	1.8	1.9	4.8	9.6	15.0	32.2	4.9	7.1	6.8	1.0	6.7
3	.7	1.7	1.9	14.5	9.8	13.4	31.9	4.9	6.6	7.4	.8	7.0
4	1.2	2.0	2.3	17.1	7.5	12.9	31.7	4.8	6.2	7.5	.6	6.7
5	1.6	2.4	2.4	17.7	7.2	11.8	31.6	4.7	8.2	7.5	.4	5.7
6	1.7	2.3	2.3	18.2	7.2	10.9	31.4	4.7	8.5	7.5	.3	7.0
7	1.7	2.0	2.4	17.5	8.7	10.5	30.6	4.6	9.5	7.3	.1	8.1
8	1.6	1.6	2.3	15.3	10.0	10.0	29.7	4.5	9.0	6.9	.1	9.1
9	1.8	1.6	2.5	14.0	10.8	9.3	24.9	4.4	7.9	6.3	.1	10.5
10	2.3	1.5	2.3	13.2	12.3	8.4	19.0	4.3	6.8	6.7	.7	10.3
11	2.8	1.7	3.3	13.3	13.0	8.0	20.1	4.3	6.2	6.1	.7	9.8
12	3.1	1.9	3.8	12.7	12.4	8.7	20.7	4.2	5.6	7.8	.3	9.3
13	3.1	2.0	3.9	12.9	13.6	10.9	21.1	4.2	4.7	5.0	1.0	9.5
14	2.9	1.9	3.6	13.0	14.5	11.8	22.0	4.2	4.0	4.6	1.2	9.3
15	2.5	1.8	3.7	17.9	15.5	10.0	22.1	4.0	4.4	4.0	1.0	9.0
16	2.5	1.7	4.0	18.4	15.5	10.4	22.6	4.1	4.3	3.3	1.0	9.3
17	2.2	1.6	4.0	19.5	14.5	8.3	22.1	4.7	4.3	2.9	1.0	10.6
18	2.0	1.6	3.8	19.8	13.0	8.0	21.1	5.9	4.2	2.3	.8	9.8
19	1.8	1.3	3.9	20.1	12.0	7.3	19.4	5.3	4.1	2.3	.8	8.7
20	1.7	1.2	3.8	22.1	11.2	7.1	16.6	5.0	4.0	2.3	.8	8.0
21	1.7	1.1	2.9	23.2	10.7	7.0	16.1	4.5	4.5	2.2	1.0	8.4
22	1.6	.9	3.1	23.8	11.1	6.8	12.3	4.3	4.6	2.2	1.6	9.6
23	1.3	.8	3.9	24.4	11.1	6.7	9.0	4.1	4.5	2.2	2.0	9.7
24	1.4	.6	4.0	24.8	11.1	6.6	7.9	4.5	4.4	2.2	3.1	9.7
25	1.1	.3	4.5	24.7	10.5	6.4	7.7	4.9	4.3	2.1	2.9	8.9
26	1.0	.3	4.7	23.7	10.3	10.9	7.1	4.3	4.3	1.6	3.6	7.9
27	.9	.8	4.3	21.3	11.3	18.7	6.9	5.6	4.3	1.6	2.5	7.0
28	1.5	1.1	4.0	20.5	13.3	24.8	6.5	7.0	4.3	1.2	4.2	7.8
29	1.9	1.4	3.9	16.0	14.3	28.6	6.1	9.0	4.3	1.1	4.9	6.5
30	2.1	1.5	3.8	12.9	.....	30.2	5.6	8.7	4.6	1.1	4.8	6.0
31	1.2	.....	4.0	11.2	.....	32.3	.....	8.2	.....	1.0	4.8	.....

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Daily gage height, in feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1876–1915—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1889.												
1	5.5	15.7	7.0	5.3	16.9	27.5	8.0	4.3	3.1	5.9	6.3	3.6
2	4.9	15.6	6.6	5.5	16.5	22.9	8.0	4.3	2.9	4.7	6.9	4.0
3	4.4	14.5	6.3	6.1	15.1	17.8	8.0	4.4	2.9	4.5	7.4	4.2
4	4.0	13.0	5.9	6.5	14.7	13.5	8.8	4.5	2.9	4.0	8.0	5.6
5	3.3	12.0	5.5	7.5	13.5	13.2	8.0	4.5	3.6	5.4	8.9	7.5
6	3.4	9.6	5.0	7.9	11.9	12.8	8.0	4.6	4.8	6.0	6.6	10.8
7	3.0	7.8	4.9	9.1	10.7	12.1	8.0	4.0	5.0	6.8	8.6	13.4
8	3.0	7.9	4.9	11.4	10.4	11.5	8.8	5.0	6.0	7.7	9.6	13.5
9	2.9	7.0	4.8	12.7	10.0	11.0	6.5	5.5	6.5	7.9	9.6	13.6
10	2.9	9.7	4.7	13.5	9.0	10.7	6.0	4.9	8.0	7.3	9.9	13.0
11	2.9	9.7	4.5	14.8	8.0	10.0	5.5	4.3	7.1	7.2	9.6	11.8
12	2.8	12.1	4.4	15.5	7.4	9.9	5.5	4.3	6.1	6.6	9.0	9.1
13	2.8	15.6	4.3	16.5	6.7	9.3	5.4	4.5	5.2	6.2	7.9	7.9
14	2.6	18.0	4.4	15.5	6.7	9.0	5.4	4.4	5.3	8.0	7.4	6.1
15	2.6	19.3	4.1	15.3	6.6	7.9	5.4	4.2	5.5	12.0	6.7	5.1
16	2.7	19.8	4.1	13.7	6.4	6.8	6.4	3.9	6.3	15.2	6.0	5.1
17	2.7	18.0	4.1	13.0	9.4	6.3	8.0	3.5	5.9	13.9	6.0	4.8
18	3.0	17.9	4.2	16.0	18.0	6.0	10.4	3.4	7.1	11.6	6.0	4.0
19	3.2	16.0	4.9	18.9	23.1	5.1	12.0	3.0	7.3	10.9	5.9	4.0
20	4.0	14.8	4.6	17.0	26.3	4.5	11.6	3.3	11.3	9.0	5.9	3.9
21	5.8	13.2	5.3	16.7	27.5	5.3	10.4	3.0	11.6	8.8	6.5	3.0
22	5.8	15.2	5.4	16.2	28.2	6.9	9.8	2.9	12.6	6.7	7.5	5.1
23	4.8	15.2	5.5	15.3	28.7	10.2	9.0	2.9	12.1	5.9	7.3	7.1
24	4.5	13.4	5.8	13.8	29.0	11.0	8.9	2.9	11.2	4.5	6.4	7.0
25	4.2	12.0	6.5	13.2	29.2	12.3	7.1	3.0	11.0	5.3	5.0	6.5
26	3.0	10.7	6.9	12.0	29.3	13.2	6.3	3.2	10.9	4.3	4.6	5.6
27	4.3	9.6	6.8	12.3	29.1	11.9	5.7	3.4	9.8	4.2	4.0	5.6
28	4.8	8.8	6.2	13.0	28.2	10.8	5.0	3.0	8.7	4.1	3.7	6.9
29	7.5	8.1	5.7	15.1	.....	9.7	4.9	2.3	7.8	4.0	3.3	5.3
30	11.4	7.7	5.4	16.6	.....	9.4	4.6	2.2	7.1	5.0	3.0	8.0
31	14.0	.....	5.5	16.9	.....	9.1	.....	2.6	.....	7.0	2.9	.....
1890.												
1	7.0	2.4	13.0	4.4	14.3	28.9	28.0	13.3	8.9	3.9	6.9	5.1
2	7.0	2.4	11.7	4.9	15.0	31.0	27.9	12.5	9.0	3.8	6.6	4.6
3	5.6	2.5	11.0	4.9	16.8	33.4	27.4	11.8	9.6	3.5	6.0	4.9
4	5.0	2.6	10.4	5.5	17.2	34.5	26.5	10.9	7.5	3.3	5.0	3.5
5	5.0	2.8	10.7	5.1	16.2	35.2	26.1	10.3	6.8	3.1	5.7	3.7
6	4.7	2.9	9.1	6.0	14.9	35.6	25.3	9.8	6.3	3.0	6.2	5.4
7	4.3	3.1	8.3	6.3	13.7	36.1	24.2	9.4	5.8	2.8	4.9	5.0
8	4.3	4.5	8.0	6.0	20.6	37.7	23.6	9.1	5.6	2.7	4.5	4.4
9	4.3	5.5	7.8	5.7	27.1	37.7	22.1	9.1	5.5	2.7	5.5	3.9
10	4.1	5.8	7.1	5.3	29.0	37.4	21.4	9.3	6.0	2.7	5.4	3.5
11	3.4	6.0	6.5	4.0	30.2	34.4	19.9	10.2	6.7	2.8	5.4	3.6
12	3.0	6.3	6.0	4.0	30.0	37.2	18.4	10.7	7.4	3.0	5.4	3.5
13	2.9	7.6	5.9	4.0	29.6	37.4	16.7	10.6	7.9	3.1	5.7	5.5
14	2.8	9.9	5.5	3.9	29.2	36.2	14.8	10.3	6.6	2.8	6.3	4.3
15	2.2	11.0	5.4	5.8	28.3	36.8	13.2	10.2	6.4	2.6	6.4	3.4
16	2.0	11.4	5.3	14.0	26.1	30.1	11.8	10.0	5.6	2.7	6.1	3.5
17	2.0	11.9	5.1	19.0	24.2	34.2	11.3	9.1	5.1	3.1	5.8	3.7
18	2.0	13.0	4.6	22.0	23.0	31.8	10.9	8.2	4.7	3.1	5.2	3.9
19	2.0	14.3	4.4	21.0	19.7	29.5	10.0	8.6	4.6	2.8	6.8	4.0
20	1.9	17.2	4.3	18.0	17.4	27.1	10.0	9.1	4.4	2.6	4.4	4.1
21	1.8	18.1	4.2	19.0	14.4	26.0	11.0	10.2	4.3	2.4	3.9	4.2
22	1.8	18.2	4.2	21.5	13.0	26.3	13.6	10.3	4.2	2.5	3.7	4.3
23	1.8	17.7	4.2	21.6	12.5	26.4	13.9	10.7	3.9	2.6	2.3	4.4
24	1.8	16.9	4.2	20.2	11.0	26.4	17.3	11.0	3.8	3.6	2.3	5.8
25	1.8	15.9	4.0	20.1	12.0	26.5	18.0	11.5	3.7	3.9	3.1	7.9
26	1.8	14.8	3.9	18.0	15.0	27.0	17.3	12.3	3.6	4.1	2.9	8.3
27	1.8	14.3	3.8	17.0	17.0	26.9	16.1	13.1	3.6	5.5	2.9	8.7
28	1.8	14.2	3.8	17.2	24.0	27.0	15.8	14.1	3.8	6.6	3.0	8.0
29	2.0	14.2	3.9	17.1	.....	27.2	15.6	12.5	3.9	5.5	3.3	7.5
30	2.2	13.8	4.0	16.0	.....	27.4	14.5	11.4	3.9	6.0	4.9	6.7
31	2.4	.....	4.2	15.1	.....	27.5	.....	11.3	.....	6.7	5.1	.....

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Daily gage height, in feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1876–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1891.												
1	6.1	8.5	2.8	12.3	20.9	32.6	24.4	8.8	4.0	6.3	5.0	6.9
2	5.6	8.0	2.7	12.4	22.6	31.7	25.9	8.4	4.0	5.6	6.9	6.4
3	5.1	7.1	2.6	14.5	24.0	30.7	27.0	8.1	3.7	4.8	8.2	5.9
4	5.5	5.9	2.6	14.5	25.9	30.5	26.4	7.6	4.5	4.3	11.8	5.5
5	5.9	6.5	2.6	13.1	27.7	29.8	25.5	7.1	5.1	4.0	12.6	5.1
6	6.0	5.9	2.6	12.4	27.9	28.5	24.5	6.1	5.1	3.8	13.6	4.7
7	8.2	5.1	5.1	13.5	28.3	29.1	23.1	6.4	4.9	3.6	15.0	4.2
8	7.8	5.0	4.4	14.6	28.6	30.2	21.7	6.1	4.8	3.6	14.7	3.9
9	7.2	4.9	4.4	15.0	28.9	32.4	20.9	5.8	4.4	3.6	14.5	3.0
10	6.5	4.8	4.4	14.0	29.3	36.5	18.5	5.6	4.2	3.7	12.1	4.1
11	6.0	4.5	4.4	13.1	30.3	37.8	18.5	5.4	4.7	3.7	8.1	4.4
12	6.1	4.1	4.8	12.3	31.3	38.2	18.9	5.1	5.5	3.7	6.7	4.6
13	6.1	4.0	5.0	14.1	33.0	38.0	19.2	5.0	5.5	3.7	5.8	4.6
14	6.3	3.9	6.9	13.7	32.6	37.7	19.1	4.8	5.7	3.7	5.3	4.6
15	5.0	3.7	7.8	13.9	33.3	37.4	18.2	4.7	5.8	3.9	4.8	4.2
16	4.6	3.6	7.5	14.1	34.1	37.4	17.1	4.6	6.0	4.2	4.6	3.9
17	4.2	3.6	7.5	14.1	34.4	37.1	16.5	4.5	7.3	3.9	4.2	3.7
18	4.2	4.5	5.9	13.9	34.6	37.0	16.2	4.4	7.5	3.8	4.0	3.4
19	4.0	4.7	5.9	13.7	34.7	37.8	16.1	4.3	6.7	3.7	3.9	3.1
20	3.9	4.4	4.8	12.2	34.9	36.5	14.8	4.2	7.0	3.7	3.6	3.0
21	3.7	4.0	4.5	11.4	35.3	36.0	13.8	4.1	7.2	3.3	3.5	2.9
22	3.7	3.9	4.2	10.6	35.7	33.6	13.3	4.6	7.0	2.9	3.4	2.8
23	3.9	3.9	3.9	10.8	36.1	32.0	12.8	4.7	7.7	2.8	3.4	2.7
24	4.9	3.9	3.8	12.2	36.0	31.3	12.2	4.6	8.1	3.5	3.4	2.6
25	5.6	3.4	4.0	14.0	35.9	31.1	12.1	4.5	8.3	3.9	3.3	2.4
26	5.8	3.3	4.4	16.5	35.1	28.9	11.8	4.3	7.8	3.9	3.3	2.2
27	6.8	3.2	5.0	16.7	34.2	22.5	11.4	4.3	6.2	3.8	3.7	2.1
28	7.3	3.1	5.5	19.9	33.3	19.9	12.2	5.4	6.1	3.8	4.1	2.0
29	8.6	3.0	6.5	20.0	.....	18.7	10.1	5.6	6.0	3.7	4.9	1.9
30	9.0	3.0	7.5	19.2	.....	19.4	10.5	6.9	6.4	3.5	6.0	1.8
31	9.0	.....	11.0	18.7	.....	21.4	.....	6.9	.....	4.1	6.8	.....
1892.												
1	1.6	1.0	6.0	13.5	11.9	10.4	13.2	19.2	8.0	6.7	4.8	4.5
2	1.5	1.0	5.5	12.7	11.5	9.4	13.1	19.3	7.6	5.9	4.8	4.5
3	1.6	1.0	5.0	11.9	10.4	8.7	15.6	16.0	9.1	6.0	5.1	4.2
4	1.5	1.0	4.9	11.8	8.5	8.4	19.0	15.1	9.1	6.8	5.2	3.9
5	1.4	1.0	4.6	11.4	7.7	7.7	20.8	12.8	10.3	6.8	4.8	3.7
6	1.5	1.0	5.5	11.2	7.3	7.1	22.1	11.6	11.1	7.8	4.6	3.7
7	1.5	1.0	7.1	10.8	7.3	7.1	24.3	10.6	10.0	8.2	4.4	3.9
8	1.5	1.0	7.2	10.8	9.8	7.0	29.2	10.0	9.8	8.7	4.3	3.9
9	1.4	1.0	8.3	10.5	12.8	6.9	31.4	9.4	10.6	10.6	4.3	4.2
10	1.4	1.0	9.1	10.5	14.6	8.8	32.1	10.3	10.9	15.3	4.4	3.6
11	1.4	1.1	9.8	10.5	15.0	9.6	33.2	10.3	10.6	20.6	4.4	2.9
12	1.3	1.4	10.4	10.9	15.1	9.7	35.5	11.1	10.0	22.1	4.3	2.6
13	1.3	2.0	10.6	11.8	14.5	9.5	35.6	11.5	9.4	21.1	5.4	2.6
14	1.3	2.1	10.7	13.3	14.5	9.4	35.8	8.2	9.0	19.7	5.6	4.1
15	1.3	2.0	10.1	16.4	14.4	9.8	35.8	7.4	8.5	17.6	4.8	4.0
16	1.3	1.7	9.1	19.3	14.1	10.0	35.7	7.5	8.2	16.2	4.0	3.7
17	1.3	1.7	8.1	21.0	13.5	9.6	35.1	7.1	7.9	15.0	3.7	3.4
18	1.3	2.2	7.3	22.4	12.5	9.4	35.1	6.6	7.1	14.2	3.6	3.0
19	1.3	3.0	6.3	23.6	11.5	9.4	34.4	7.3	6.2	13.2	3.5	2.7
20	1.3	3.5	5.8	24.6	11.6	9.9	33.1	8.7	5.8	11.6	3.8	2.6
21	1.3	3.4	5.6	25.0	12.0	11.5	33.1	9.5	5.4	10.6	3.8	3.0
22	1.3	3.4	5.4	26.7	13.1	12.2	32.6	9.5	5.2	10.0	3.8	4.3
23	1.2	4.2	6.4	28.0	14.4	13.8	32.0	9.1	5.2	9.4	3.9	5.5
24	1.2	5.2	7.7	28.5	15.2	16.1	31.0	8.9	5.3	7.9	3.5	5.5
25	1.2	5.2	8.2	28.8	15.2	14.6	31.3	8.7	6.8	7.9	3.4	5.1
26	1.2	5.6	8.6	29.0	14.5	15.0	31.7	8.5	7.3	7.4	3.5	4.6
27	1.1	4.9	9.0	28.4	13.6	14.6	28.9	8.0	7.8	6.8	4.3	4.3
28	1.1	4.7	9.8	26.6	12.0	14.0	26.7	7.9	8.2	6.4	4.4	4.1
29	1.1	4.9	11.6	23.5	11.3	13.9	24.5	8.2	8.0	5.8	4.4	3.5
30	1.0	6.0	12.4	18.7	.....	13.9	22.5	9.2	7.1	5.5	4.2	3.1
31	1.0	.....	12.8	15.0	.....	13.3	.....	9.6	.....	5.0	4.2	.....

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Daily gage height, in feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1876–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1893.												
1	3.1	1.1	4.9	12.2	5.1	32.3	8.3	13.8	18.0	5.6	2.8	1.3
2	3.2	1.1	5.2	12.6	6.2	30.1	7.8	15.0	21.8	4.6	2.6	1.2
3	3.4	1.1	5.7	13.1	6.2	28.8	6.9	16.0	25.0	4.6	2.6	3.4
4	3.2	1.3	5.9	10.3	10.4	24.2	6.6	17.0	26.0	4.3	2.4	3.4
5	2.7	1.5	6.0	9.6	10.5	19.2	6.5	18.2	24.6	4.2	2.5	3.4
6	2.4	1.6	6.1	8.5	10.5	15.0	6.5	20.2	22.3	3.9	2.4	3.7
7	2.2	1.4	5.9	8.0	10.4	14.4	6.4	22.5	23.3	3.8	2.4	4.8
8	2.0	1.5	6.0	7.5	10.0	13.2	6.3	23.6	23.8	4.8	2.5	4.8
9	1.9	1.7	5.8	6.3	8.2	12.8	12.0	24.9	24.9	4.1	2.7	4.8
10	1.9	1.6	5.7	6.8	8.2	12.0	16.6	25.7	24.8	3.9	2.8	4.5
11	1.8	1.7	5.5	5.5	7.9	11.8	16.6	26.2	23.6	3.8	2.9	4.3
12	1.7	2.8	5.4	5.3	8.0	12.8	19.9	26.8	23.0	3.8	3.0	4.0
13	1.6	3.0	5.3	5.2	10.8	13.8	16.6	27.0	22.6	3.6	3.0	4.2
14	1.6	4.1	8.9	5.0	13.8	15.1	14.3	26.0	20.0	3.4	3.1	4.5
15	1.6	5.2	9.2	4.7	16.6	15.6	20.4	23.8	18.2	3.4	3.1	4.6
16	1.6	5.5	9.4	4.2	19.6	15.6	24.6	20.6	16.9	3.2	3.1	4.6
17	1.5	5.6	13.8	4.1	23.6	15.2	29.4	17.9	13.0	3.0	3.0	4.5
18	1.5	5.1	15.5	5.8	27.7	14.5	29.9	16.0	10.1	2.8	3.0	8.1
19	1.5	4.9	17.5	3.6	30.1	13.0	29.0	14.5	7.6	2.8	2.7	9.2
20	1.5	5.0	17.1	3.5	32.0	11.4	27.0	11.8	6.6	2.8	2.6	8.8
21	1.4	5.4	16.5	3.1	33.4	10.4	23.8	11.2	6.5	2.7	2.5	7.7
22	1.3	5.9	17.0	3.1	33.6	9.2	21.2	10.6	6.4	2.6	2.8	6.5
23	1.3	6.1	17.2	3.1	33.5	9.1	17.0	10.1	6.1	2.5	3.7	5.5
24	1.3	6.0	16.6	3.1	33.5	9.5	13.2	9.1	5.9	2.5	3.8	4.5
25	1.3	5.5	15.8	3.2	33.6	8.7	11.8	8.5	5.7	2.6	3.4	4.1
26	1.3	5.0	15.0	3.3	33.6	8.7	10.9	8.2	5.6	2.6	2.2	3.9
27	1.3	5.1	13.8	3.7	33.5	8.7	11.3	7.4	5.6	3.1	2.2	3.5
28	1.2	5.5	11.6	4.4	33.2	9.0	12.4	7.6	5.8	3.6	2.0	3.2
29	1.1	5.7	10.0	4.0	.....	9.2	13.0	7.9	5.9	3.8	1.9	3.0
30	1.1	5.0	9.1	5.2	.....	8.8	13.4	10.6	6.0	3.8	1.6	2.8
31	1.1	.....	7.6	5.1	.....	8.5	.....	12.0	.....	3.2	1.4	.....
1894.												
1	2.6	3.1	2.2	2.7	7.1	10.7	9.6	4.8	4.8	2.1	3.2	2.8
2	2.5	3.1	2.3	2.6	6.6	10.8	8.5	4.6	4.5	2.0	3.0	2.6
3	2.4	2.9	2.5	2.6	6.4	10.7	10.7	4.4	4.1	2.0	3.0	2.4
4	2.3	2.8	2.7	2.7	13.3	10.4	11.3	4.3	3.8	2.3	3.1	2.3
5	2.0	2.7	2.8	2.9	20.6	10.2	13.9	4.4	3.5	2.9	3.1	2.5
6	1.9	2.6	3.4	3.8	24.0	10.8	14.6	4.4	3.2	3.3	2.8	2.7
7	1.8	2.5	4.8	4.0	24.8	11.9	14.6	4.2	3.0	3.6	2.5	2.7
8	1.6	2.4	4.5	6.2	26.4	12.7	13.5	4.3	2.9	4.0	2.3	2.5
9	1.9	2.1	4.3	7.0	29.0	12.8	12.2	4.5	2.8	4.3	2.2	2.3
10	1.7	2.0	4.2	6.9	30.1	12.4	12.7	4.8	2.6	4.0	2.1	1.8
11	1.8	1.9	4.4	8.1	31.0	11.6	14.3	4.8	2.5	3.5	2.1	1.6
12	1.9	1.8	4.2	11.1	31.0	10.9	14.0	4.6	2.2	3.0	2.1	1.6
13	2.0	1.7	4.0	13.4	31.1	10.4	13.0	4.5	2.1	3.7	2.0	1.6
14	2.2	1.6	3.8	13.4	31.1	10.0	11.9	4.6	2.0	2.6	1.9	1.5
15	2.0	1.8	3.7	12.1	30.7	9.6	11.4	4.7	1.9	2.6	1.9	1.3
16	2.0	1.9	3.8	11.6	29.9	9.2	10.9	5.1	1.9	2.8	1.8	1.3
17	2.0	2.6	4.4	12.2	28.7	9.1	10.5	5.3	1.9	2.8	1.6	1.3
18	1.9	3.8	5.1	13.3	26.7	10.1	9.9	5.1	1.8	2.6	1.4	1.3
19	1.0	2.6	5.3	11.9	26.7	11.4	9.1	4.7	1.9	2.4	1.4	1.4
20	4.5	2.4	4.8	10.9	18.3	13.9	8.9	4.4	1.9	2.6	1.4	1.7
21	4.1	2.3	4.5	9.3	16.2	15.4	8.2	4.1	1.9	3.1	2.1	1.8
22	5.7	2.3	4.4	10.7	14.5	15.4	7.5	4.4	1.9	3.2	2.9	1.8
23	5.0	2.4	3.7	11.0	13.6	15.6	6.9	4.6	1.9	2.9	2.8	1.8
24	4.4	2.5	3.7	10.9	12.8	16.1	6.5	4.7	1.9	2.6	3.0	1.7
25	3.7	2.5	3.6	10.7	12.1	17.4	6.1	4.9	2.6	2.6	3.2	1.5
26	3.2	2.3	3.6	10.5	11.6	17.6	5.8	5.4	2.2	2.9	3.6	1.2
27	2.7	2.3	3.4	9.5	11.2	16.4	5.4	5.9	2.2	3.1	4.2	1.0
28	2.5	2.2	3.2	9.5	11.0	15.2	5.3	6.1	2.2	3.2	4.4	1.0
29	2.5	2.2	3.0	8.2	.....	13.6	5.2	6.0	2.3	3.0	3.9	1.0
30	2.5	2.2	2.8	7.7	.....	10.9	4.9	5.7	2.2	3.2	3.5	1.0
31	2.4	.....	2.7	7.4	.....	9.6	.....	5.3	.....	3.3	3.1	.....

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Daily gage height, in feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1876–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1895.												
1	0.9	0.2	0.5	6.1	11.8	7.6	14.3	8.4	8.2	2.6	6.6	3.5
2	.7	.2	.5	7.0	12.2	7.7	11.6	8.1	7.7	2.6	7.6	3.3
3	.6	.1	.5	6.7	11.5	8.2	11.4	7.7	7.0	2.6	6.7	3.0
4	.4	.1	.5	5.8	10.7	10.2	10.5	7.4	6.4	3.3	5.5	3.0
5	.4	.1	.6	4.9	10.2	12.2	9.7	7.0	5.9	5.0	4.5	3.0
6	.3	.2	.6	4.4	9.8	14.0	9.0	6.6	5.7	5.7	3.8	2.9
7	.3	.4	.6	3.9	9.6	16.0	8.4	6.9	5.1	5.9	3.7	2.8
8	.3	.6	.6	4.2	9.3	17.6	8.3	6.3	4.6	6.2	3.0	2.7
9	.3	.8	.8	6.5	9.5	18.8	8.8	6.0	4.3	6.5	2.8	2.6
10	.5	.8	1.0	10.0	9.8	18.8	10.1	7.1	4.1	6.9	2.7	2.5
11	.6	.7	1.3	11.8	9.4	17.3	11.9	7.7	4.0	6.9	2.4	2.4
12	.7	.7	1.2	14.2	9.1	15.0	12.8	8.3	4.2	7.5	2.6	2.9
13	.7	.6	1.5	17.3	8.1	13.8	13.1	8.9	4.3	7.4	2.7	3.0
14	.6	.5	1.8	19.3	7.1	12.4	13.3	9.3	4.2	6.9	2.8	2.7
15	.5	.5	2.2	20.7	6.3	13.2	13.2	9.2	3.9	6.3	2.8	2.3
16	.4	.4	3.9	21.2	5.8	15.3	12.6	9.0	3.6	5.7	2.4	2.0
17	.3	.4	7.4	23.6	5.5	15.3	11.5	8.9	3.5	5.4	2.4	1.8
18	.3	.4	9.0	24.8	5.3	16.4	10.7	8.8	3.3	5.1	2.4	1.9
19	.4	.5	9.2	25.5	5.2	16.0	10.4	8.5	3.2	4.6	2.9	2.3
20	.8	.5	8.4	25.0	5.3	17.1	9.8	8.1	3.1	4.5	2.4	2.5
21	1.0	.5	7.1	23.4	5.4	20.3	9.7	7.6	3.2	4.7	2.4	2.3
22	.9	.5	5.8	21.0	5.7	23.1	10.8	7.0	3.3	4.4	2.7	2.0
23	.8	.4	4.8	19.5	6.1	24.7	11.6	6.7	3.3	3.7	3.9	1.8
24	.6	.4	4.1	18.5	6.5	23.6	11.3	6.5	3.1	3.5	5.3	1.6
25	.5	.5	3.5	17.3	6.8	24.1	10.4	6.4	2.9	3.3	5.7	1.4
26	.4	.5	3.2	16.2	6.9	24.1	9.0	6.3	2.9	3.1	5.5	1.3
27	.3	.5	3.1	15.6	7.3	24.1	8.7	6.0	2.9	3.0	5.2	1.2
28	.3	.5	2.9	15.6	7.6	23.9	8.5	6.2	2.8	2.7	4.7	1.2
29	.2	.5	3.4	15.5	.....	23.0	8.7	7.2	2.7	2.5	4.3	.9
30	.2	.5	3.7	14.5	.....	20.6	8.7	8.3	2.6	2.4	4.1	.8
31	.2	.....	4.4	13.6	.....	17.5	.....	8.6	.....	2.9	3.9	.....
1896.												
1	.6	.0	.8	7.6	8.0	6.0	12.6	7.3	3.5	3.1	9.8	1.7
2	.5	.1	.9	7.0	12.3	6.0	16.0	7.5	3.5	2.5	8.5	1.7
3	.4	.2	.9	6.6	19.9	5.9	19.7	7.5	3.3	2.3	7.2	2.4
4	.4	.2	1.2	6.2	24.1	5.7	22.6	7.1	3.0	2.2	6.0	2.5
5	.3	.2	1.3	5.9	25.9	5.5	24.2	6.5	2.8	2.5	5.2	2.2
6	.3	.3	1.4	5.7	26.5	5.7	24.9	6.1	2.7	3.6	4.6	1.9
7	.2	.3	1.3	5.5	25.4	7.3	25.5	5.8	3.1	4.2	4.2	1.6
8	.2	.3	1.2	5.4	23.9	8.8	26.0	5.4	4.0	4.2	4.0	1.3
9	.2	.5	1.1	5.5	22.0	9.1	26.6	5.2	4.8	4.0	3.8	1.2
10	.1	.6	1.0	5.6	21.0	8.6	27.2	5.2	5.0	3.9	3.8	1.0
11	.1	.8	1.0	5.7	20.8	7.6	27.9	5.0	4.7	3.9	3.8	.8
12	.1	.9	1.0	5.3	20.7	6.8	28.3	4.8	4.3	4.6	3.7	.7
13	.1	.9	1.1	5.1	20.1	6.2	27.7	4.5	4.2	8.0	3.3	.7
14	.1	.9	1.1	4.7	20.1	5.9	24.8	4.3	4.5	12.3	3.0	1.0
15	.1	.8	1.0	4.4	20.3	6.0	19.4	3.9	5.5	15.2	2.7	1.3
16	.1	.8	1.0	4.1	20.5	6.5	13.8	3.6	5.7	16.0	2.5	1.4
17	.1	.7	1.0	3.9	20.0	9.6	10.4	3.3	5.5	14.9	2.4	1.3
18	.1	.9	1.0	3.7	19.3	13.3	8.5	2.9	4.6	13.3	2.4	1.1
19	.1	1.2	1.0	3.3	18.5	15.5	7.4	2.9	4.3	13.0	2.3	.9
20	.1	1.3	1.2	3.4	17.3	17.2	6.8	2.9	3.8	12.5	2.3	.7
21	.1	1.3	1.3	3.3	15.6	19.2	6.3	2.9	3.3	12.2	2.2	.6
22	.1	1.2	1.3	3.2	13.3	20.6	5.9	2.9	3.0	12.2	2.1	.6
23	.1	1.0	1.3	3.1	11.5	20.9	5.8	2.8	2.8	11.7	2.1	.5
24	.1	1.0	1.3	3.2	10.0	20.6	5.6	2.8	2.7	10.1	2.1	.4
25	.1	.9	1.3	3.5	8.8	19.5	5.5	2.7	2.9	8.4	2.0	.4
26	.1	.8	1.3	4.2	8.1	17.6	5.3	2.6	3.0	7.3	1.9	.4
27	.1	.8	2.7	5.0	7.1	15.5	5.6	2.6	3.3	7.5	1.8	.3
28	.0	.8	8.6	5.9	6.4	13.5	6.3	2.8	3.1	8.0	1.7	.4
29	.0	.8	11.9	5.7	6.1	11.9	7.2	3.3	3.5	7.9	1.6	.4
30	.0	.8	10.9	7.9	.....	11.0	7.6	3.5	3.6	8.1	1.6	.5
31	.0	.....	8.8	8.0	.....	10.6	.....	3.6	.....	9.4	1.6	.....

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Daily gage height, in feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1876–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1897.												
1	0.8	0.3	11.0	2.9	6.1	21.8	40.1	8.3	4.5	4.8	8.2	2.0
2	1.1	.3	10.9	2.8	5.5	23.1	38.5	8.3	4.4	4.8	6.7	1.9
3	1.3	.3	10.3	2.7	5.9	24.2	36.2	7.8	4.2	4.9	5.5	1.9
4	1.2	.3	10.9	2.6	7.3	25.4	34.0	7.3	4.1	4.7	4.7	1.7
5	1.1	.3	11.8	3.0	8.2	26.0	32.6	7.0	4.0	4.3	4.1	1.6
6	1.3	.3	12.4	3.4	10.5	24.9	32.1	7.0	4.0	4.0	3.6	1.3
7	1.4	.3	12.0	3.8	12.0	22.9	32.0	7.8	4.0	3.7	3.3	1.1
8	1.5	.5	10.5	3.8	13.6	22.9	32.0	8.9	4.0	3.6	3.3	1.1
9	1.5	.7	8.7	3.7	14.6	24.0	32.0	8.9	4.0	3.3	3.4	1.0
10	1.6	.7	7.4	3.6	15.0	25.3	31.1	8.5	3.9	3.3	3.2	.8
11	1.6	.6	6.3	3.5	15.3	26.4	30.5	8.0	3.8	3.3	3.3	.8
12	1.4	.8	5.5	3.4	15.8	27.7	30.1	7.8	3.8	3.3	3.5	.7
13	1.2	2.2	5.0	3.3	16.2	29.3	29.8	8.0	3.9	3.5	3.6	.7
14	1.0	3.9	4.8	3.4	16.3	31.2	29.5	9.7	3.8	3.8	4.1	.6
15	.8	4.9	5.1	3.6	15.4	32.8	28.8	12.1	4.1	3.8	4.4	.5
16	.6	4.5	5.5	4.0	14.1	33.7	26.9	14.8	4.6	3.9	4.1	.4
17	.5	5.2	6.2	4.5	12.7	34.8	24.0	17.0	4.7	3.9	3.7	.4
18	.4	5.8	6.5	6.0	12.2	36.0	20.6	18.5	4.3	3.8	3.3	.3
19	.4	5.7	6.2	7.8	11.9	37.5	17.6	19.5	3.8	3.8	2.9	.2
20	.3	5.1	5.6	9.7	11.9	40.5	15.4	19.5	3.5	3.7	2.5	.1
21	.3	4.5	5.3	10.5	10.7	43.7	14.0	18.1	3.3	4.2	2.2	.1
22	.5	3.9	4.7	10.6	10.1	46.2	12.8	15.2	3.3	5.5	2.2	.1
23	.6	3.5	4.4	10.6	10.4	47.4	11.9	12.0	3.1	6.1	2.2	.1
24	.7	3.0	4.6	10.4	11.4	48.0	10.9	9.5	2.9	6.0	2.3	.0
25	.7	2.6	4.6	10.3	12.5	47.7	9.9	8.0	3.0	5.8	2.3	.0
26	.7	2.5	4.5	9.6	15.0	47.2	9.5	7.0	3.5	5.7	2.3	— .1
27	.7	2.5	4.5	9.9	18.0	46.6	8.6	6.4	3.9	5.4	2.3	— .1
28	.5	3.9	3.8	8.3	20.1	45.7	8.0	5.9	4.1	5.6	2.3	— .1
29	.5	6.5	3.1	6.6	.....	44.7	7.5	5.5	4.4	7.1	2.4	— .1
30	.4	8.8	3.3	6.5	.....	43.6	7.2	5.3	4.8	9.2	2.4	— .1
31	.3	.....	3.1	6.3	.....	42.1	.....	4.8	.....	9.5	2.1	.....
1898.												
1	— .1	.6	.0	6.3	23.8	4.3	15.0	9.0	3.9	3.0	5.5	3.1
2	— .1	.6	.0	5.5	22.0	4.4	15.5	8.8	4.3	2.5	5.9	3.0
3	— .2	.5	.1	4.9	19.3	4.4	16.6	8.5	4.0	2.3	5.9	3.0
4	— .2	.4	.4	4.5	16.2	4.2	18.7	8.0	3.6	2.0	7.0	3.0
5	— .2	.2	1.4	4.1	13.5	4.0	20.6	7.5	3.1	2.0	7.6	2.9
6	— .3	.1	2.8	3.9	11.0	3.7	21.5	7.0	2.9	1.9	7.5	2.8
7	— .3	.1	3.5	3.6	9.4	3.6	21.7	6.6	2.6	1.9	6.7	7.8
8	— .3	.1	3.6	3.4	7.8	3.4	21.2	6.2	2.5	1.9	5.6	13.0
9	— .3	.1	3.7	3.3	6.7	3.4	20.5	5.8	2.3	1.7	6.0	15.6
10	— .3	.3	3.8	3.1	6.0	3.3	19.7	5.4	1.8	2.2	9.9	16.5
11	— .3	.4	3.7	3.1	5.5	3.4	19.2	5.0	1.6	2.4	13.0	15.4
12	— .3	.5	3.5	6.7	5.3	3.4	18.2	4.7	1.7	2.0	13.6	12.7
13	— .3	.6	3.2	7.4	5.1	3.4	17.2	4.4	1.7	1.7	12.3	10.1
14	— .3	.6	2.9	8.1	5.0	3.5	15.8	4.3	1.5	1.8	10.7	8.0
15	— .3	.5	2.7	12.8	4.8	4.0	14.5	4.2	1.5	2.0	10.2	6.8
16	— .3	.4	2.5	17.9	4.6	4.8	13.6	4.2	1.4	1.4	11.3	5.9
17	— .3	.4	2.3	22.3	4.4	5.8	12.5	4.2	1.5	2.6	12.6	5.2
18	— .3	.5	2.2	23.9	4.3	7.8	11.8	4.0	1.7	2.6	13.3	4.6
19	— .3	.5	2.0	23.0	4.2	8.6	11.3	3.8	1.8	2.5	12.7	4.1
20	— .3	.5	2.5	22.8	4.1	8.9	11.4	3.6	1.8	2.4	11.1	3.7
21	.0	.5	5.0	24.4	4.0	8.7	13.8	3.5	1.8	2.8	9.0	3.4
22	.1	.4	8.0	25.8	3.8	8.2	15.4	4.9	1.9	3.7	7.6	3.3
23	.2	.2	11.2	28.8	3.7	7.8	15.1	4.8	2.0	3.9	6.1	3.2
24	.3	.1	12.8	29.1	3.6	7.6	13.9	3.4	2.4	3.6	5.5	3.1
25	.3	.1	13.3	28.9	3.5	7.9	12.4	4.0	3.4	3.5	5.1	3.1
26	.4	.1	13.3	27.8	3.5	7.8	11.3	3.7	4.6	3.2	4.9	3.0
27	.4	.1	12.9	26.4	3.4	7.9	10.7	3.4	4.9	3.0	4.5	3.2
28	.7	.0	11.9	25.6	4.0	8.0	10.4	3.1	4.7	3.4	4.5	3.8
29	.6	— .1	9.9	25.1	.....	10.3	9.9	3.0	4.1	4.0	3.9	4.4
30	.6	— .1	8.4	24.8	.....	11.6	9.4	3.0	3.6	4.6	3.7	5.1
31	.5	.....	7.2	24.3	.....	13.6	.....	3.3	.....	4.6	3.2	.....

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Daily gage height, in feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1876–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1899.												
1	5.3	5.7	5.6	5.3	8.4	25.3	38.9	12.3	4.0	2.2	3.1	0.7
2	4.8	5.0	5.1	5.2	7.7	26.1	36.7	11.2	3.8	2.2	3.1	.6
3	4.0	4.7	4.9	5.2	7.9	25.9	35.8	9.9	3.7	2.5	3.5	.5
4	3.5	4.3	4.9	5.1	8.5	25.5	34.4	9.0	3.7	2.6	3.6	.4
5	3.1	3.9	4.8	5.5	11.6	26.6	32.8	8.7	3.6	2.5	3.7	.8
6	2.7	3.7	4.9	6.7	17.0	26.9	31.1	7.8	3.5	2.5	3.5	1.0
7	2.6	3.6	5.2	10.6	21.9	25.6	29.3	7.2	3.5	2.4	3.0	.9
8	2.6	3.4	5.3	16.4	24.9	23.8	29.4	6.9	3.6	2.4	2.6	1.3
9	6.9	3.2	5.5	20.2	26.7	22.8	25.5	6.6	3.8	2.2	2.3	1.6
10	11.1	3.4	5.6	22.4	27.2	22.9	24.5	7.0	3.8	1.9	2.1	1.4
11	12.2	3.5	5.8	23.4	27.4	23.4	23.8	8.0	3.6	1.7	1.9	1.4
12	10.9	3.7	5.7	23.1	27.8	23.9	23.4	8.9	3.5	1.6	1.9	1.3
13	9.1	3.8	5.5	23.1	28.1	24.5	22.7	10.4	3.3	1.6	1.8	1.1
14	7.9	3.8	5.2	23.9	28.5	24.1	21.4	11.1	3.1	1.8	1.7	1.0
15	6.7	3.9	5.0	22.6	28.9	23.4	19.6	11.1	3.0	1.7	1.7	.9
16	6.0	4.0	4.5	20.0	29.4	25.2	15.4	10.6	3.2	1.6	1.6	.7
17	5.3	4.3	4.3	17.5	29.6	27.6	15.3	9.7	3.6	1.6	1.5	.7
18	5.0	4.0	4.0	15.3	29.4	29.3	13.4	9.2	4.3	1.5	1.4	.7
19	4.7	4.0	3.9	13.7	27.4	31.3	12.3	8.9	4.8	1.5	1.5	.7
20	4.5	3.9	4.5	12.5	22.2	32.9	11.3	8.6	5.0	1.4	1.4	.8
21	4.2	3.7	4.5	11.5	20.6	34.4	10.4	8.2	5.1	1.3	1.4	.8
22	4.4	3.7	5.0	10.6	18.0	35.8	9.7	7.5	5.1	1.3	1.5	.7
23	5.2	4.1	5.9	9.0	16.8	36.6	9.1	6.8	4.7	1.3	1.8	.5
24	6.6	4.8	6.7	9.9	16.3	37.3	9.0	6.1	4.2	1.8	1.8	.5
25	7.9	5.8	7.0	10.6	15.4	37.9	10.0	5.8	3.8	2.6	1.5	.4
26	8.0	6.6	6.7	10.4	16.0	38.2	11.6	5.4	3.5	2.7	1.3	.3
27	7.5	6.9	6.2	11.3	19.3	38.5	13.8	5.0	3.1	2.9	1.2	.2
28	6.8	6.7	5.7	11.5	23.0	38.7	14.2	4.8	2.9	3.0	1.1	.1
29	6.7	6.5	5.5	11.1	.....	39.1	14.0	4.5	2.6	3.5	.9	.1
30	6.2	6.0	5.3	10.2	.....	39.5	13.3	4.3	2.5	3.6	.9	.2
31	6.0	.....	5.3	9.4	.....	39.7	.....	4.1	.....	3.4	.7	.....
1900.												
1	.3	.1	1.4	6.8	5.5	11.7	13.3	13.3	4.5	28.6	6.0	2.3
2	.3	.1	1.4	6.2	5.1	12.3	12.3	11.8	4.5	26.6	7.2	2.8
3	.3	.0	1.4	5.5	4.7	13.0	11.1	10.6	4.7	23.6	7.5	2.8
4	.2	.0	1.3	4.9	4.4	13.0	10.6	9.7	5.2	19.8	7.0	2.6
5	.2	.0	1.2	4.3	4.0	12.7	10.0	8.5	6.2	17.0	6.2	2.3
6	.2	.0	1.2	3.7	3.7	12.5	9.5	7.7	7.7	14.7	5.5	2.1
7	.2	.0	1.0	3.1	4.2	13.2	9.3	7.0	8.9	12.2	4.8	1.8
8	.2	.1	.9	2.7	5.1	14.3	9.3	6.4	10.6	10.0	4.2	1.7
9	.1	.1	.9	2.4	10.0	15.6	9.6	6.2	11.6	8.6	3.8	1.7
10	.1	.1	.9	2.2	10.7	16.7	9.7	6.0	11.6	7.5	3.6	1.6
11	.0	.1	1.1	2.0	10.8	17.3	10.3	5.9	11.2	6.7	2.9	1.5
12	.0	.3	1.7	3.2	11.5	17.7	14.3	5.6	10.4	6.2	2.7	1.3
13	.0	.4	5.5	5.6	11.5	18.1	17.9	5.2	9.5	5.6	2.4	1.1
14	.1	.5	7.3	8.7	12.5	18.3	19.3	4.9	8.7	5.3	2.0	.9
15	.1	.4	8.1	10.2	15.0	17.9	19.1	4.7	10.1	5.2	1.9	.8
16	.2	.4	9.0	11.0	17.2	16.6	17.6	4.4	11.1	5.0	1.8	.7
17	.5	.4	9.2	11.4	19.0	14.7	15.5	4.2	10.9	4.7	1.7	.6
18	.7	.3	8.6	10.9	20.3	12.8	15.2	4.1	10.5	4.3	1.6	.6
19	.7	.3	7.9	10.4	21.0	11.4	20.5	4.0	10.1	4.0	1.6	.8
20	.7	.2	7.9	9.9	21.3	10.9	24.1	4.0	9.9	3.9	1.5	1.0
21	.6	.2	8.7	10.7	20.6	11.3	26.7	4.0	9.2	3.8	1.7	1.8
22	.5	.2	9.0	11.9	18.7	13.0	28.1	3.9	9.2	4.5	1.9	2.8
23	.4	.2	8.3	13.0	15.7	13.9	29.1	3.9	11.6	4.1	1.8	3.5
24	.3	.3	8.1	13.3	13.5	14.5	28.9	3.4	13.6	3.8	1.7	3.9
25	.3	.4	9.0	12.7	12.5	15.5	28.0	5.0	16.6	3.7	1.6	3.9
26	.2	.4	10.1	11.6	12.0	17.2	26.6	5.1	19.4	3.9	2.0	3.5
27	.1	.5	10.3	10.5	11.9	18.6	24.0	4.7	23.9	3.9	1.8	3.1
28	.1	.7	10.2	8.9	11.8	18.7	21.2	4.2	26.7	3.8	1.6	2.3
29	.1	1.0	9.4	8.0	.....	17.5	18.3	3.8	29.1	5.6	1.5	1.8
30	.1	1.3	8.5	7.0	.....	15.8	15.5	3.9	29.5	7.0	1.5	1.6
31	.1	.....	7.6	6.2	.....	14.4	.....	4.2	.....	5.8	1.7	.....

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Daily gage height, in feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1876–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1901.												
1	1.8	5.1	14.4	6.5	9.2	4.5	17.7	21.3	22.1	8.2	2.0	13.8
2	1.8	5.1	15.0	6.0	9.2	4.5	19.4	19.5	18.1	7.6	1.9	12.0
3	1.7	4.3	14.5	6.3	9.5	4.4	20.0	17.4	17.9	6.8	1.8	10.8
4	1.6	3.8	12.7	6.4	12.0	4.2	20.6	15.5	14.6	6.0	1.8	8.1
5	1.5	3.1	10.2	6.5	15.7	4.0	21.0	13.6	13.0	5.6	1.8	9.8
6	1.3	2.8	8.1	6.6	17.7	4.0	21.2	11.7	11.4	5.2	1.8	9.5
7	1.3	2.5	6.8	6.4	18.1	4.4	21.7	10.2	10.1	5.2	1.8	9.3
8	2.6	2.3	6.0	6.2	17.7	4.3	22.2	8.9	9.0	5.3	2.1	9.2
9	2.7	2.3	6.1	5.8	16.7	4.2	22.5	7.8	8.0	5.1	2.5	8.5
10	2.6	2.6	7.0	5.6	15.5	5.6	22.6	7.2	7.8	4.9	2.3	7.6
11	2.5	3.0	8.0	6.0	14.5	9.6	21.9	6.6	8.0	4.6	2.0	6.7
12	2.2	3.1	8.0	9.2	13.7	15.0	19.1	6.3	8.3	4.4	6.1	5.9
13	2.9	3.1	7.9	14.4	12.6	18.2	16.8	6.2	8.1	4.5	8.2	5.4
14	4.6	3.0	7.1	19.5	11.0	19.0	14.0	5.8	8.1	4.8	8.0	5.2
15	6.1	2.6	6.2	21.7	10.5	18.4	11.9	5.7	8.2	5.1	7.5	6.0
16	5.5	2.5	5.6	22.8	9.8	16.8	10.8	5.6	7.6	4.8	6.9	6.8
17	4.8	2.1	5.0	23.5	9.2	15.5	10.4	5.4	6.9	4.3	8.3	8.4
18	4.0	2.0	4.6	23.9	8.9	12.0	10.7	5.4	6.3	3.9	15.0	10.4
19	3.5	1.9	4.2	24.0	8.4	10.0	12.2	5.3	6.1	3.6	19.5	11.7
20	2.8	1.8	3.8	23.5	7.8	9.7	14.1	5.1	6.8	3.0	22.6	12.7
21	2.2	7.2	3.8	21.4	7.2	7.7	17.9	5.1	7.8	3.1	24.9	12.2
22	1.9	9.4	3.8	17.3	6.7	7.0	21.2	5.7	8.3	3.2	26.0	11.8
23	2.0	8.6	4.2	13.0	6.0	7.0	22.8	5.8	8.3	3.3	26.7	11.0
24	2.2	7.5	4.9	10.7	5.8	6.8	23.7	10.0	7.9	3.3	27.3	10.0
25	2.5	7.8	5.5	11.0	5.6	6.6	24.1	14.0	7.5	3.1	27.5	8.8
26	2.6	8.8	5.9	11.7	5.2	6.4	24.5	16.7	7.5	3.0	27.6	7.6
27	2.6	8.6	6.0	12.3	5.0	6.4	24.7	18.7	8.2	2.9	27.2	6.7
28	3.0	9.6	6.5	11.6	4.8	7.1	24.6	20.1	7.9	2.7	26.1	5.8
29	3.4	10.0	6.9	11.0	.....	9.0	24.2	21.4	7.5	2.6	24.0	5.3
30	4.2	13.5	6.8	10.4	.....	12.5	23.1	22.3	8.0	2.5	20.6	5.0
31	6.0	.....	6.4	9.9	.....	15.6	.....	22.7	.....	2.2	16.8	.....
1902.												
1	5.2	2.0	1.8	20.9	24.6	15.0	35.0	7.5	5.2	3.8	1.7	.5
2	5.3	2.0	1.8	22.6	26.4	18.3	35.6	7.0	4.8	3.8	1.8	.8
3	5.0	1.9	1.9	23.7	27.4	20.7	35.6	6.9	4.1	3.2	2.2	1.1
4	4.7	1.9	1.9	24.6	27.5	22.0	34.6	6.9	3.9	3.9	2.7	1.4
5	4.4	1.9	1.8	25.4	27.0	23.4	33.2	8.1	3.8	6.9	2.6	1.5
6	4.3	1.9	1.8	26.2	26.8	24.6	32.2	9.4	3.5	7.8	2.1	1.5
7	4.3	1.9	1.8	27.0	26.5	25.8	31.4	9.6	3.0	7.0	1.6	1.4
8	4.2	1.8	1.7	27.8	26.2	27.1	30.2	8.8	3.0	6.4	1.4	1.2
9	4.0	1.7	1.8	28.5	25.2	28.3	28.0	7.7	2.9	5.7	1.3	.9
10	4.0	1.7	2.2	28.5	23.0	29.2	24.7	6.9	2.9	4.9	1.4	.7
11	3.9	1.7	2.5	27.0	19.2	29.8	20.9	6.2	2.8	4.1	1.5	.6
12	3.8	1.7	2.7	22.6	15.2	30.4	17.5	5.8	2.6	3.6	1.5	.5
13	3.6	1.8	2.9	16.4	12.3	30.8	15.0	5.6	2.5	3.2	1.5	.5
14	3.6	1.8	4.8	11.8	10.2	30.8	13.2	5.5	2.5	2.9	1.2	.5
15	3.4	1.8	7.3	9.3	9.2	30.0	11.6	4.9	2.5	2.7	1.1	.4
16	3.4	1.8	10.0	8.0	8.8	28.2	10.6	4.9	2.4	2.5	1.2	.4
17	3.4	1.8	15.1	7.2	8.7	25.3	10.0	4.8	2.3	2.3	1.4	.4
18	3.4	1.7	18.6	6.1	8.4	22.0	9.3	4.6	2.3	2.6	1.4	.5
19	3.4	1.7	20.6	6.3	8.0	19.7	8.9	4.6	2.3	3.2	1.3	.7
20	3.5	1.7	21.7	6.6	7.8	18.5	8.7	4.3	2.2	3.6	1.1	.8
21	3.5	1.7	22.4	6.7	7.5	17.9	8.2	4.3	2.2	3.0	1.0	.9
22	3.5	1.7	22.8	7.5	7.0	17.6	7.9	4.2	2.2	3.0	.8	.8
23	3.2	1.7	22.4	8.5	7.9	17.1	7.5	4.1	2.3	2.5	.7	.7
24	3.1	1.7	19.6	9.6	8.2	16.2	7.3	3.9	2.8	2.3	.6	.6
25	2.8	1.7	15.0	9.8	8.9	14.7	7.0	3.8	3.3	2.0	.6	.6
26	2.7	1.7	11.2	10.0	9.9	13.0	6.8	3.8	3.3	1.9	.5	.8
27	2.5	1.6	9.5	12.3	11.3	12.0	6.4	3.8	3.1	1.6	.5	1.2
28	2.3	1.6	9.0	14.3	13.0	12.0	6.1	3.8	3.0	1.5	.6	1.4
29	2.2	1.6	10.8	16.7	.....	24.0	6.1	3.8	2.8	1.5	.6	1.7
30	2.2	1.6	14.0	18.7	.....	30.4	8.1	3.7	3.3	1.4	.6	2.0
31	2.0	.....	18.0	21.8	.....	33.9	.....	3.6	.....	1.5	.5	.....

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Daily gage height, in feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1876–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1903.												
1	3.1	0.6	6.4	8.4	7.8	23.2	22.2	10.6	5.4	4.2	2.4	1.4
2	3.5	.6	7.1	8.0	7.4	23.5	21.5	9.9	8.0	4.3	2.4	1.3
3	3.5	.5	8.1	9.0	7.0	25.0	20.8	9.6	10.4	4.3	2.0	1.1
4	3.3	.4	8.6	10.0	9.8	25.9	20.0	9.4	11.5	4.3	2.0	1.0
5	3.0	.4	9.6	11.5	14.5	26.3	19.4	9.0	13.8	4.0	1.9	1.0
6	2.9	.4	10.7	11.3	18.1	27.0	18.5	8.4	17.1	4.0	2.0	1.0
7	2.8	.4	11.8	10.5	20.5	28.3	17.0	7.8	18.7	3.8	2.4	1.0
8	2.7	.6	11.9	10.1	21.5	30.1	16.6	7.4	17.2	3.6	2.7	.9
9	2.5	.6	10.9	9.7	22.8	31.9	15.6	7.0	15.7	3.5	3.5	.8
10	2.2	.6	9.8	9.5	24.2	32.9	16.2	6.7	14.2	3.5	3.8	.7
11	2.0	.5	8.8	9.5	25.2	33.7	18.2	6.5	13.3	3.6	4.0	.6
12	1.8	.5	7.9	9.4	25.8	33.5	20.0	6.2	13.1	3.7	3.9	.6
13	1.7	.5	7.3	10.5	26.3	33.1	21.3	6.0	12.3	3.7	3.7	.5
14	1.8	.5	6.8	11.0	26.8	32.7	22.8	5.9	11.5	4.6	3.5	.5
15	2.2	.9	8.0	10.7	27.0	32.3	23.2	6.4	10.7	5.0	3.4	.4
16	2.5	1.0	17.0	10.8	28.1	31.8	25.6	8.8	9.5	4.7	3.1	.4
17	2.7	1.0	19.6	9.9	28.4	31.3	26.5	10.4	8.6	4.6	3.0	.4
18	2.5	.9	19.9	9.5	28.4	30.5	26.9	9.8	7.7	4.9	3.0	.3
19	2.3	.8	15.5	8.7	28.8	29.0	26.8	8.5	6.8	5.1	3.1	.3
20	2.2	.8	14.7	8.0	29.1	26.7	26.5	7.4	6.1	5.0	3.4	.3
21	2.4	.7	12.6	7.4	29.2	23.7	25.9	7.1	5.5	4.9	3.6	.3
22	2.4	.7	12.5	6.9	29.1	20.7	25.0	6.7	4.9	4.7	3.6	.3
23	2.2	.6	13.4	6.5	29.1	18.4	23.5	6.1	4.7	4.5	3.3	.3
24	2.0	.7	14.5	6.0	29.1	16.6	21.5	5.6	4.7	3.9	3.1	.3
25	1.8	1.0	13.4	5.8	29.0	15.3	19.4	5.1	4.5	3.7	2.9	.3
26	1.5	2.3	13.4	5.5	28.7	14.5	17.5	4.7	4.5	3.5	2.7	.3
27	1.4	4.4	12.4	5.2	27.2	15.6	15.9	4.3	4.5	3.2	2.5	.3
28	1.1	5.5	11.9	5.5	25.0	18.0	14.3	4.2	4.7	3.0	2.3	.3
29	1.0	5.5	9.7	6.6	.....	19.7	12.9	4.0	4.6	2.8	2.1	.3
30	.9	5.8	9.7	7.9	.....	21.0	11.6	4.1	4.4	2.6	1.8	.3
31	.7	.....	9.0	8.1	.....	22.0	.....	4.8	.....	2.4	1.7	.....
1904.												
1	.3	.0	1.6	3.3	6.5	7.3	26.9	4.6	3.8	2.5	1.6	1.8
2	.3	.0	1.3	3.4	5.7	7.0	25.8	4.5	3.9	2.3	1.6	1.8
3	.2	.2	1.1	3.5	5.0	7.3	24.4	4.2	4.5	2.2	1.6	1.7
4	.2	.4	.9	3.6	4.4	8.2	22.3	4.8	5.5	2.2	1.7	1.6
5	.1	.5	.8	3.4	4.1	8.3	19.4	5.5	6.0	2.8	2.0	1.5
6	.0	.8	.7	3.2	3.7	7.8	17.1	6.4	6.1	3.0	1.9	1.2
7	.0	1.0	.6	2.7	3.5	7.6	15.1	6.5	5.8	3.2	1.8	1.2
8	.0	1.3	.5	2.5	3.3	7.4	13.5	6.0	5.3	3.4	1.9	1.1
9	.2	1.3	.5	2.2	3.2	7.9	12.3	5.9	5.1	3.8	2.0	1.0
10	.0	1.4	.4	2.0	3.4	8.9	11.5	5.8	5.2	4.0	2.2	.8
11	.2	1.2	.4	1.9	3.5	9.5	11.1	5.7	4.9	3.9	2.5	.8
12	.4	1.1	.4	1.8	3.7	10.7	10.8	5.7	4.3	3.5	2.9	.7
13	.4	.9	.4	1.7	4.7	11.8	10.3	5.7	3.8	3.1	3.2	1.0
14	.4	.9	.4	1.6	5.3	12.8	9.9	6.0	3.3	2.7	3.6	1.1
15	.3	.8	.4	1.6	5.5	13.2	9.8	6.4	3.1	2.7	3.8	1.0
16	.3	.7	.4	1.5	5.3	13.5	8.1	6.5	2.9	2.7	3.7	.8
17	.3	.7	.4	1.7	5.0	13.4	7.4	6.1	2.7	2.7	3.4	.7
18	.5	.8	.4	1.9	4.5	13.2	6.7	5.8	2.5	2.7	3.4	.5
19	.6	1.3	.4	2.2	4.2	12.6	6.1	5.2	2.2	2.8	3.3	.4
20	.6	2.3	.9	2.4	4.0	11.5	5.6	4.9	2.1	2.8	3.0	.3
21	.5	2.7	2.3	2.5	3.7	10.2	5.3	4.6	2.1	2.5	2.9	.3
22	.4	2.3	4.3	3.4	3.6	9.5	5.2	4.3	2.2	2.4	3.0	.2
23	.3	3.3	5.5	6.3	3.9	11.2	5.2	3.9	2.1	2.2	2.9	.1
24	.2	4.3	4.4	8.0	3.9	15.0	5.1	3.7	1.9	2.2	2.6	.2
25	.2	4.3	4.0	8.9	4.0	17.7	5.0	3.5	1.7	2.0	2.4	.3
26	.1	3.7	4.4	9.3	4.8	20.6	6.0	3.4	1.7	1.8	2.1	.2
27	.0	3.2	4.8	10.7	6.0	24.1	6.0	3.2	1.7	1.6	1.8	.0
28	.0	2.7	4.7	10.9	7.0	26.5	5.6	3.3	1.8	1.4	1.7	.0
29	.1	2.2	4.3	9.9	7.4	27.8	5.3	3.0	2.2	1.4	1.7	.0
30	.1	2.9	3.8	8.7	.....	28.1	4.9	2.9	2.5	1.4	1.6	.0
31	.0	.....	3.5	7.5	.....	27.7	.....	3.7	.....	1.6	1.8	.....

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Daily gage height, in feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1876–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1905.												
1	−0.1	−0.9	−0.1	11.9	5.2	21.2	6.8	6.7	8.9	10.0	4.3	4.9
2	− .1	− .9	.0	11.7	5.3	18.8	6.4	7.7	7.7	10.5	4.1	4.7
3	− .2	− .9	.1	10.3	4.8	15.6	6.0	8.4	6.8	11.0	3.7	4.9
4	− .3	− .9	.2	8.8	4.5	12.8	5.8	9.0	6.0	11.7	3.4	4.7
5	− .3	− .8	.4	7.4	4.2	11.0	5.8	9.1	6.0	10.8	3.1	4.4
6	− .4	− .7	.5	6.2	4.6	9.7	5.7	8.8	5.6	9.1	3.0	5.4
7	− .4	− .6	1.0	5.6	6.1	8.8	5.6	8.9	5.1	7.5	3.0	4.7
8	− .4	− .5	1.6	5.2	8.5	8.1	5.4	8.9	4.7	6.2	3.1	4.1
9	− .4	− .5	2.8	4.9	11.8	9.0	5.3	8.7	4.3	5.5	3.0	3.5
10	− .3	− .5	3.5	4.9	16.8	14.2	5.0	8.2	4.0	5.2	2.9	3.0
11	− .3	− .5	4.1	4.9	20.7	18.2	5.0	7.8	3.7	5.4	2.7	3.3
12	− .3	− .5	4.5	5.8	22.7	20.8	5.4	7.3	3.5	5.3	2.5	3.2
13	− .4	− .5	4.8	11.2	23.6	21.2	5.9	7.8	3.4	5.8	3.1	3.2
14	− .5	− .5	4.6	14.5	24.0	20.7	6.2	8.6	3.1	6.4	3.5	3.2
15	− .5	− .5	4.0	15.5	24.0	20.6	6.4	8.8	3.0	6.5	4.2	3.0
16	− .5	− .5	3.6	15.4	23.8	20.0	6.6	8.4	2.9	6.5	5.5	2.7
17	− .6	− .4	2.9	16.2	22.8	18.8	6.8	7.7	2.9	7.5	6.9	2.5
18	− .6	− .3	2.5	16.8	20.8	16.7	7.1	7.0	3.0	9.6	8.0	2.2
19	− .7	− .3	2.2	16.7	18.2	14.1	7.3	6.8	3.3	10.4	8.4	2.0
20	− .7	− .3	1.9	15.0	16.2	12.2	7.1	8.6	3.4	10.0	8.1	2.0
21	− .7	− .3	1.8	12.8	15.2	10.7	6.7	11.4	3.5	8.8	7.6	2.0
22	− .8	− .4	1.6	10.5	16.6	9.8	6.3	12.8	3.4	7.2	7.0	1.9
23	− .8	− .3	1.5	8.9	20.7	10.0	5.7	14.5	4.2	6.2	6.3	1.9
24	− .8	− .2	1.6	7.7	22.6	10.5	5.5	17.1	5.1	5.1	5.6	1.8
25	− .8	− .1	1.8	6.7	23.5	10.7	5.2	17.9	8.1	4.9	5.4	1.7
26	− .9	.0	1.9	6.1	23.9	10.5	5.0	19.5	8.4	4.7	4.9	1.5
27	− .9	.0	4.0	5.2	23.9	10.0	5.0	20.1	8.0	4.5	4.5	1.4
28	− .9	.0	9.0	5.0	23.3	9.3	5.0	19.1	7.5	4.5	4.2	1.2
29	− .9	.0	11.2	4.8	.....	8.5	5.2	15.7	8.5	4.4	4.9	1.0
30	− .9	.0	12.1	4.5	.....	7.8	5.9	13.0	9.0	4.2	5.5	1.0
31	− .9	.0	11.7	5.0	.....	7.3	.....	10.6	.....	4.2	5.3	.....
1906.												
1	.8	3.3	2.0	10.8	17.7	7.0	20.2	6.8	3.7	5.9	9.3	6.6
2	.8	3.4	1.8	9.9	15.0	6.7	22.0	6.6	4.5	5.7	8.5	6.3
3	.8	3.4	2.0	9.0	13.0	6.5	21.4	6.3	4.4	5.3	8.0	7.0
4	.7	3.0	2.7	9.3	11.8	7.0	21.0	6.0	4.7	4.8	7.7	9.0
5	.7	2.8	2.7	9.8	10.7	9.1	20.0	5.8	4.8	4.4	8.0	10.3
6	.7	2.6	3.2	10.3	10.3	11.0	18.5	5.6	4.8	4.1	8.7	10.2
7	.9	2.4	3.4	12.4	9.7	11.5	16.7	5.8	4.7	4.0	8.8	9.5
8	.9	2.2	5.9	13.8	9.6	12.1	15.0	5.7	4.7	3.8	8.3	8.6
9	.9	2.0	8.6	14.0	8.4	12.0	14.0	5.8	4.8	3.5	7.9	8.0
10	.8	1.8	9.2	15.1	7.2	11.0	13.5	6.0	4.6	3.3	7.6	8.0
11	.8	1.6	9.3	14.5	7.1	9.9	12.8	6.0	4.4	3.3	7.4	8.6
12	1.1	1.5	9.1	13.5	6.9	9.5	12.5	6.6	4.1	3.5	7.2	9.4
13	2.0	1.5	9.6	12.3	6.5	8.5	11.8	7.5	3.9	3.4	6.7	9.6
14	2.9	1.4	10.1	12.3	6.1	8.0	11.5	7.9	3.7	5.4	6.4	9.9
15	2.8	1.4	9.7	12.2	5.9	8.7	11.6	7.7	3.5	8.0	6.1	9.9
16	2.7	1.3	11.3	11.5	5.7	10.4	11.4	7.0	3.4	6.9	6.1	9.1
17	2.7	1.4	12.3	10.9	5.4	13.6	10.9	6.3	3.2	6.9	6.0	8.1
18	3.2	1.5	12.9	10.4	5.2	14.9	10.0	5.6	3.5	9.0	5.8	7.1
19	3.5	1.4	11.8	10.0	5.0	15.0	9.9	5.0	4.7	12.0	5.8	6.2
20	4.1	1.3	11.5	10.2	4.9	14.8	9.9	4.8	6.0	13.3	6.4	5.6
21	4.1	1.2	10.5	10.7	4.8	15.3	10.1	4.4	7.5	13.6	6.8	5.2
22	3.9	1.2	10.0	11.2	4.7	16.4	10.3	4.2	7.5	14.5	7.2	5.6
23	3.6	1.1	10.8	12.0	4.8	16.5	10.1	4.0	6.9	15.2	7.2	6.1
24	3.3	1.1	13.0	16.4	4.9	15.9	9.4	3.7	6.2	14.8	7.4	7.4
25	3.7	1.1	15.0	20.1	5.6	15.8	8.4	3.5	5.4	13.8	7.2	10.1
26	2.5	1.1	15.9	22.2	5.7	15.3	7.6	3.3	5.0	13.3	7.0	11.1
27	2.4	1.1	15.5	22.0	6.2	12.5	6.9	3.3	4.5	13.5	6.6	11.1
28	2.5	1.1	14.8	21.0	6.8	12.3	6.6	3.7	4.5	13.2	6.5	10.5
29	3.2	1.1	14.4	20.9	.....	12.7	6.7	4.0	4.9	12.2	6.4	10.1
30	3.4	2.2	13.3	20.9	.....	14.7	6.9	4.5	5.5	11.0	6.5	11.9
31	3.3	.....	12.0	20.0	.....	17.0	.....	4.7	.....	10.0	6.9	.....

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Daily gage height, in feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1876–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1907.												
1	15.1	5.9	15.3	14.6	12.8	10.0	8.4	14.2	6.5	6.2	3.3	3.4
2	15.9	5.5	11.7	18.2	14.1	15.6	7.5	16.7	7.6	6.4	3.1	3.3
3	15.0	5.2	9.3	21.3	18.3	21.6	6.8	16.2	8.5	6.2	3.0	3.2
4	17.5	4.9	8.2	23.0	21.4	24.4	6.1	14.3	8.7	6.3	3.1	2.9
5	20.8	4.3	7.4	24.0	22.5	25.4	6.1	12.5	8.1	6.6	4.0	2.6
6	22.8	4.3	7.1	24.1	22.1	25.1	7.0	11.7	7.8	6.4	4.5	2.5
7	24.1	4.2	6.8	23.2	20.8	24.6	7.9	17.5	7.6	5.9	4.4	2.6
8	25.2	4.1	6.5	21.2	18.6	24.0	8.0	19.5	7.7	5.9	4.1	2.7
9	25.3	4.0	6.3	18.3	16.1	22.8	8.1	21.7	8.3	4.9	3.5	2.5
10	24.2	3.9	6.1	15.8	14.5	20.6	8.4	21.7	8.8	4.5	3.2	2.5
11	22.6	3.8	6.0	14.1	13.3	18.8	10.1	20.6	9.0	4.3	3.0	2.6
12	20.5	3.7	6.2	13.0	12.4	17.5	10.9	20.0	8.9	4.0	3.2	2.6
13	17.9	3.5	6.2	12.1	11.0	16.4	10.8	20.4	9.0	3.9	3.5	2.6
14	15.0	3.3	6.3	11.3	10.4	15.7	10.5	20.5	10.5	3.8	3.3	2.7
15	12.1	3.6	6.2	10.6	9.5	18.8	10.2	21.0	11.7	4.4	3.2	3.4
16	10.2	3.6	6.4	9.8	8.8	21.1	9.8	22.1	12.0	4.9	3.1	3.7
17	9.1	3.6	9.0	9.3	8.2	22.5	9.3	21.7	11.5	4.9	3.5	4.3
18	8.2	16.8	11.4	9.2	7.4	21.8	8.6	20.5	11.0	5.4	4.0	4.3
19	7.8	19.6	9.0	9.1	7.2	20.7	8.0	18.5	10.7	6.4	3.9	3.9
20	7.6	22.1	14.1	9.5	7.0	19.4	7.7	16.0	11.5	6.5	3.7	3.5
21	7.6	22.4	13.2	10.3	6.8	18.2	7.3	13.5	12.7	6.2	3.5	3.2
22	7.9	21.5	12.3	11.0	6.6	17.1	7.3	11.0	12.1	5.8	3.3	3.0
23	8.2	21.9	12.3	12.0	6.0	15.9	7.3	9.9	10.2	5.5	3.3	2.8
24	8.1	22.8	12.3	12.4	6.0	14.8	7.7	8.6	8.2	5.1	3.2	3.0
25	7.9	23.6	12.0	12.5	6.9	13.9	8.1	7.8	7.1	4.9	3.1	4.1
26	7.9	24.4	11.0	14.0	7.6	13.0	8.2	7.2	6.6	4.5	3.2	4.6
27	8.4	24.7	10.8	14.5	8.0	12.1	8.6	7.0	6.4	4.2	3.4	5.3
28	8.2	24.8	9.7	14.2	8.4	11.3	8.8	6.9	6.4	4.1	3.5	7.6
29	7.7	23.9	9.7	14.1	.....	10.8	9.6	6.5	6.3	3.9	3.6	9.1
30	6.9	20.1	8.9	13.6	.....	10.1	10.3	6.1	6.4	3.7	3.5	9.3
31	6.3	.....	12.5	13.1	.....	9.3	.....	5.9	.....	3.3	3.3	.....
1908.												
1	8.6	1.4	12.5	11.8	7.6	14.0	19.5	14.8	7.0	3.8	2.7	5.5
2	7.6	1.5	11.5	13.9	8.9	13.4	16.9	15.1	7.1	4.2	2.7	5.8
3	6.1	1.7	9.8	15.6	10.5	13.9	14.6	14.1	7.0	4.3	2.6	5.7
4	5.5	2.0	8.3	17.1	11.4	14.2	12.7	12.6	7.0	4.4	2.6	5.0
5	5.0	2.1	7.1	19.2	11.6	14.7	11.5	11.1	8.0	4.3	2.5	4.3
6	4.9	2.2	6.2	20.4	12.8	14.8	11.3	11.4	8.9	3.9	3.0	4.2
7	4.5	2.5	5.6	21.0	12.9	14.5	11.3	14.0	9.0	3.9	3.2	4.7
8	4.1	2.2	4.9	20.2	12.9	14.4	13.2	16.6	8.0	3.8	3.5	5.1
9	4.0	2.3	4.9	19.0	12.3	14.3	15.4	15.9	7.4	4.3	3.5	4.6
10	3.7	2.9	5.1	18.2	11.8	13.9	15.8	14.3	7.9	5.5	3.4	4.1
11	3.3	3.4	4.8	17.3	13.7	13.2	15.0	12.7	8.1	6.4	3.4	3.6
12	3.4	3.8	4.6	16.0	16.5	13.9	13.8	11.7	7.9	6.6	3.7	3.4
13	3.4	4.0	4.8	14.6	19.7	15.0	12.4	11.2	7.4	6.6	4.1	3.6
14	3.3	4.1	4.9	13.7	21.4	16.0	11.2	11.0	7.0	6.7	4.5	3.9
15	3.1	4.5	5.1	13.4	23.4	16.2	10.2	10.9	6.4	6.7	4.7	4.0
16	3.0	5.8	5.4	14.0	24.4	16.0	9.5	10.6	6.0	6.6	4.7	3.8
17	2.8	7.5	6.8	15.7	25.3	16.1	8.9	10.0	5.7	6.9	4.2	3.2
18	2.7	8.5	7.3	17.7	25.9	16.3	8.4	9.7	5.3	5.2	3.8	2.8
19	2.5	8.0	7.8	19.0	26.1	15.9	10.5	9.8	5.0	4.5	3.5	2.5
20	2.3	6.8	7.9	18.8	26.4	15.3	12.2	9.9	4.7	4.2	3.3	2.2
21	2.2	6.0	7.8	17.4	26.8	14.8	13.8	10.1	4.5	4.0	3.2	1.9
22	2.1	5.7	7.6	14.4	27.1	14.5	13.9	9.7	4.5	3.9	3.0	1.8
23	2.0	6.0	7.5	13.5	27.0	14.7	13.2	8.5	4.7	3.9	2.8	1.7
24	2.0	6.0	8.2	11.9	26.1	15.2	12.0	7.8	4.7	3.7	2.7	2.5
25	1.9	6.9	8.3	10.9	23.7	17.4	11.5	7.1	4.4	3.6	3.0	2.5
26	1.8	8.2	8.5	9.9	20.8	20.2	13.5	7.1	4.2	3.5	3.6	2.2
27	1.7	9.6	8.5	9.1	18.1	21.6	14.9	7.0	4.0	3.4	4.4	2.1
28	1.6	11.3	8.5	8.5	16.3	22.1	14.3	7.4	3.9	3.4	5.7	1.9
29	1.5	12.5	8.6	8.1	15.0	22.3	13.0	7.7	3.7	3.2	6.0	1.7
30	1.5	13.0	8.8	7.7	.....	22.4	14.0	7.6	3.7	3.0	5.7	1.6
31	1.5	.....	10.0	7.3	.....	21.4	.....	7.2	.....	2.8	5.3	.....

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Daily gage height, in feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1876–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1909.												
1	1.5	3.2	2.9	9.7	6.6	32.9	16.8	12.9	13.3	13.3	5.6	3.2
2	1.4	3.8	2.6	9.0	6.6	32.1	17.1	14.1	15.0	13.0	5.4	3.0
3	1.3	3.3	2.6	9.0	6.2	31.4	17.5	16.9	15.7	12.1	5.3	2.8
4	1.1	2.2	2.4	9.0	6.2	30.3	17.4	19.7	14.3	11.0	5.1	2.5
5	1.0	3.3	2.1	8.9	6.0	28.5	16.4	21.0	13.6	10.4	6.0	2.7
6	.9	4.7	2.0	8.7	6.3	25.8	14.6	21.8	15.3	9.8	7.1	2.7
7	.9	4.7	2.4	8.7	7.0	22.7	14.3	22.3	19.3	9.5	8.0	2.9
8	.9	4.2	3.6	9.1	7.2	20.0	13.1	22.5	21.2	9.1	8.6	3.0
9	.9	3.7	6.4	9.7	7.8	18.3	13.3	21.7	22.2	8.7	8.9	3.0
10	.9	3.4	9.4	10.3	8.8	18.8	13.6	19.7	22.9	8.3	8.7	2.8
11	.9	3.1	11.4	10.6	10.6	19.9	13.1	16.4	23.0	8.7	7.8	3.0
12	1.0	2.9	12.8	10.5	13.8	20.3	12.3	13.7	22.5	11.5	6.8	3.1
13	1.0	2.8	13.3	10.0	16.3	21.8	12.4	12.0	21.2	14.8	6.1	3.5
14	1.0	2.6	12.7	9.3	18.3	23.6	13.9	11.1	20.2	16.4	5.6	3.4
15	1.0	2.3	11.3	8.8	22.0	25.3	15.0	10.7	17.4	16.5	5.1	3.1
16	.9	2.1	9.9	9.4	24.7	27.0	14.8	11.4	15.6	15.0	4.8	3.0
17	1.2	2.2	8.7	11.1	26.4	28.2	13.4	11.4	14.0	13.0	4.7	2.9
18	1.7	2.1	8.2	12.5	27.1	29.0	12.2	10.8	13.1	12.8	4.5	2.8
19	2.2	2.3	7.7	14.4	26.7	29.5	11.2	9.8	12.8	13.0	4.5	3.1
20	2.2	2.6	7.4	16.0	26.0	29.9	10.2	9.8	12.5	12.9	4.6	2.9
21	2.1	2.8	6.9	16.7	25.3	30.0	10.2	9.4	12.1	12.0	5.0	2.7
22	1.9	2.9	6.3	17.2	24.8	29.0	9.5	8.7	11.5	10.7	8.6	2.6
23	1.7	2.9	6.1	17.2	24.4	26.9	9.1	9.0	11.7	8.9	9.6	2.3
24	1.3	2.8	6.5	16.3	26.3	23.3	8.6	10.1	13.5	7.8	8.6	2.3
25	1.2	2.6	8.9	14.3	28.9	19.8	8.5	11.8	14.4	6.9	7.1	2.7
26	1.0	2.4	10.2	12.2	31.3	17.0	9.7	15.0	13.9	6.4	5.8	2.9
27	.9	2.6	11.5	10.4	32.5	16.0	11.0	17.7	13.0	6.0	4.9	3.0
28	.8	2.5	12.5	9.4	32.9	15.5	12.3	18.7	12.3	5.8	4.5	3.2
29	.8	2.7	12.5	8.0	.....	14.8	12.4	17.7	12.3	6.0	3.9	3.5
30	.7	3.0	11.5	7.5	.....	15.4	12.4	15.0	13.0	5.9	3.7	4.2
31	1.4	.....	10.8	6.9	.....	16.3	.....	12.7	.....	5.8	3.4	.....
1910.												
1	4.3	2.1	1.8	4.7	8.7	13.8	3.8	5.4	14.3	7.2	5.8	2.9
2	4.0	2.0	1.8	4.6	7.1	12.7	3.8	5.6	11.6	8.4	5.5	2.8
3	3.5	1.9	1.8	4.6	6.9	12.8	3.7	6.1	9.9	9.2	5.4	2.9
4	3.1	1.8	1.8	3.4	6.6	13.1	3.6	6.3	7.7	9.8	5.6	3.5
5	2.8	1.8	1.8	3.4	6.5	14.7	3.5	6.1	7.5	10.6	6.2	4.0
6	2.5	1.8	1.8	4.0	5.8	16.0	3.4	5.8	7.2	11.8	6.8	4.7
7	2.1	1.8	1.8	6.0	5.6	16.5	3.3	5.4	6.9	13.1	6.3	7.1
8	2.0	1.7	2.2	9.0	5.4	15.9	3.2	5.0	6.7	14.7	5.9	7.6
9	2.0	1.7	2.6	11.8	5.3	14.7	3.2	4.7	7.2	15.3	5.6	7.1
10	1.8	1.7	3.2	12.4	5.2	13.0	3.0	4.4	8.0	15.6	6.1	6.4
11	1.8	1.7	3.7	13.4	5.0	12.0	3.0	4.3	10.2	15.6	6.4	6.0
12	1.7	1.7	3.9	13.6	5.5	11.0	2.9	4.8	13.2	15.7	6.7	5.8
13	1.6	1.7	4.6	13.1	5.2	10.1	2.9	6.1	13.5	15.5	6.4	5.4
14	1.6	1.7	5.0	13.0	4.8	9.2	2.8	7.4	12.1	14.7	6.0	5.0
15	1.9	1.7	5.0	11.8	5.0	8.6	3.2	7.9	11.0	13.7	5.8	4.7
16	2.6	1.6	4.9	10.7	5.0	8.0	12.0	8.0	11.2	12.9	5.3	4.5
17	3.7	1.6	4.9	9.8	5.3	7.7	12.8	7.6	11.1	11.9	4.8	4.4
18	5.0	1.6	5.6	7.9	8.6	7.1	14.8	7.1	10.2	11.0	4.3	4.3
19	5.2	1.6	5.6	8.2	14.7	6.9	13.4	6.6	9.5	11.7	3.9	3.9
20	5.3	1.6	6.0	8.1	16.7	6.3	11.7	6.3	8.9	13.7	3.6	3.5
21	5.6	1.6	6.1	8.6	18.9	5.9	10.7	7.6	8.7	13.8	3.5	3.2
22	5.0	1.6	5.7	8.8	20.5	5.8	10.0	8.9	8.5	12.2	3.3	2.9
23	4.2	1.6	5.1	9.5	21.2	5.6	9.9	11.1	8.3	10.6	3.1	2.8
24	4.0	1.6	4.7	10.5	21.2	5.4	9.0	13.7	8.0	8.9	3.7	2.6
25	3.5	1.7	4.3	11.5	20.4	5.4	8.2	14.8	7.6	7.9	3.5	2.4
26	3.1	2.0	3.9	12.0	18.7	5.0	7.3	15.6	7.3	7.3	3.5	2.2
27	2.9	2.1	3.9	12.3	16.7	4.7	6.7	16.3	6.9	6.9	3.6	2.1
28	2.6	2.1	4.0	12.1	15.3	4.5	6.0	16.7	6.5	6.8	3.4	2.0
29	2.4	1.9	4.7	11.4	.....	4.3	5.8	16.7	6.3	7.1	3.2	2.0
30	2.3	1.8	4.8	10.4	.....	4.1	5.5	16.2	6.2	7.3	3.1	2.0
31	2.1	.....	4.7	9.6	.....	3.9	.....	15.0	.....	6.6	3.0	.....

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Daily gage height, in feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1876–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June.	July.	Aug.	Sept.
1911.												
1	2.0	1.3	1.4	5.6	7.8	8.3	9.6	11.6	4.2	3.8	4.6	1.8
2	2.0	1.4	1.6	6.7	7.9	8.8	9.6	10.4	3.8	3.3	4.1	1.6
3	2.0	1.2	1.6	10.0	7.8	8.7	9.2	9.4	3.6	3.0	4.2	1.4
4	2.0	1.2	1.6	16.4	8.0	8.3	9.1	9.0	3.4	2.9	4.8	1.3
5	2.0	1.1	1.8	21.0	8.9	8.0	15.1	9.5	3.2	3.0	5.0	1.2
6	2.3	1.2	2.0	23.3	9.8	7.6	19.7	11.0	3.1	3.2	4.4	1.3
7	2.7	1.2	2.7	24.1	10.6	7.1	23.7	11.8	3.0	3.0	4.5	1.4
8	2.9	1.2	3.0	24.6	12.7	6.8	26.2	11.6	3.0	2.9	4.4	2.1
9	3.0	1.2	6.8	24.9	16.8	6.4	28.1	10.6	3.1	2.7	4.7	2.8
10	2.8	1.2	9.2	24.8	20.8	6.3	29.2	9.2	3.2	2.4	4.8	2.7
11	2.7	1.2	10.5	24.0	23.4	6.1	30.1	8.1	3.1	2.3	4.6	2.7
12	2.6	1.1	9.7	21.5	24.9	7.8	30.9	7.3	2.9	2.6	4.2	2.7
13	2.4	1.0	9.4	17.0	25.3	12.5	31.6	6.7	2.8	2.7	3.8	2.8
14	2.3	1.0	8.2	12.9	25.5	15.4	33.2	6.4	2.7	2.8	3.5	3.1
15	2.3	1.0	7.8	10.1	25.7	16.4	34.7	5.9	2.7	2.8	3.2	2.9
16	2.9	.9	5.9	8.6	25.7	15.3	35.7	5.7	2.7	2.9	3.0	2.7
17	3.5	.9	4.9	8.4	25.3	13.1	36.1	5.4	2.7	3.3	2.9	2.3
18	3.7	.9	4.6	7.0	23.7	10.8	35.8	5.1	2.4	3.7	2.8	2.0
19	3.3	.9	3.8	6.5	20.4	8.9	35.3	4.9	2.2	3.7	3.0	1.9
20	2.9	.8	3.5	6.1	16.8	7.9	34.1	4.7	2.0	3.7	3.2	2.1
21	2.5	.8	3.3	5.8	14.1	7.3	32.9	4.6	2.0	3.7	3.3	2.1
22	2.1	.8	2.9	5.6	12.0	6.9	32.2	4.6	2.1	4.3	3.7	1.8
23	1.9	.7	2.6	5.4	10.9	6.5	31.6	5.0	2.2	6.0	3.4	1.6
24	1.8	.7	2.7	5.4	10.6	6.1	30.9	5.3	2.2	6.6	3.2	1.5
25	1.6	.7	3.0	5.2	9.4	5.9	29.9	6.5	2.2	6.1	2.9	1.4
26	1.4	.7	3.1	5.5	8.9	6.0	28.1	6.6	2.4	5.6	2.7	1.3
27	1.3	.7	3.2	6.0	8.6	6.2	24.7	6.2	3.2	5.8	3.3	1.3
28	1.3	.8	3.3	5.8	8.4	7.0	21.3	5.8	3.6	5.6	3.0	1.2
29	1.2	1.2	3.3	5.8	.....	7.9	16.2	5.3	3.9	5.7	2.7	1.2
30	1.2	1.2	4.3	6.7	.....	8.6	13.0	4.9	3.7	5.7	2.6	1.1
31	1.2	.....	4.7	7.5	.....	9.3	.....	4.5	.....	5.3	2.2	.....
1912.												
1	1.1	2.7	4.8	29.6	15.2	26.2	29.1	31.5	10.5	6.1	5.1	4.5
2	1.1	2.5	5.0	30.4	16.1	25.2	31.6	32.3	10.8	7.3	5.0	3.8
3	1.4	2.2	5.1	31.0	17.0	24.1	33.5	32.3	10.8	9.3	5.0	3.5
4	1.7	2.0	4.9	30.5	17.5	22.8	34.7	31.7	10.4	8.9	4.7	3.2
5	1.7	1.9	4.5	29.0	17.2	21.0	35.3	30.8	9.4	8.9	4.4	3.0
6	1.4	1.8	4.3	26.8	16.2	19.0	35.4	29.9	8.8	7.8	4.3	2.8
7	1.1	2.0	4.0	23.7	14.5	17.2	35.1	29.2	8.3	7.7	4.8	2.5
8	.9	2.2	3.8	19.7	12.4	16.1	34.7	28.3	7.4	9.3	5.2	2.3
9	.9	2.2	3.7	16.0	10.5	16.4	34.4	27.1	6.9	10.9	5.6	2.3
10	.8	2.2	3.3	14.5	9.2	18.0	34.0	25.2	6.5	12.1	5.5	2.1
11	1.0	2.2	3.2	14.6	8.2	19.0	33.6	22.8	6.3	12.6	5.8	2.0
12	1.4	2.4	4.6	14.8	7.6	19.1	33.0	20.4	5.9	11.8	6.4	1.9
13	1.7	2.8	11.7	13.7	7.0	19.1	32.0	18.5	5.6	11.1	6.4	1.7
14	1.8	3.5	14.9	12.6	6.8	18.9	29.8	16.9	5.3	11.1	5.8	1.6
15	1.8	4.3	18.8	11.7	6.2	20.7	26.6	16.2	5.1	10.5	5.2	1.8
16	1.8	5.0	21.3	10.6	6.2	23.0	23.2	13.5	4.8	9.8	4.8	2.1
17	2.2	5.3	22.4	9.6	6.4	25.0	20.5	11.8	4.6	9.5	5.0	2.2
18	3.3	5.7	22.1	8.9	7.0	26.4	19.7	10.7	4.4	8.9	4.9	2.2
19	3.7	5.9	20.3	9.6	7.3	26.8	20.1	9.7	4.5	8.5	4.5	2.2
20	4.2	5.7	17.5	10.2	7.6	26.8	20.3	9.0	4.6	7.9	4.0	2.2
21	4.7	5.4	15.0	11.0	11.8	26.8	19.6	8.5	4.6	7.4	4.0	2.2
22	5.0	5.2	12.8	11.2	16.4	26.7	18.3	8.2	4.7	7.3	4.0	2.0
23	5.3	5.0	11.5	10.0	17.9	26.5	17.0	8.1	4.8	6.8	4.0	2.0
24	5.7	5.3	13.4	9.1	19.1	27.5	16.4	8.1	4.7	6.4	4.3	2.3
25	6.0	5.5	15.1	8.6	19.3	28.6	16.8	7.9	4.5	6.0	4.3	4.6
26	6.2	5.3	15.5	8.3	20.7	29.2	17.0	7.5	4.4	5.9	4.4	5.8
27	5.5	5.0	22.3	8.2	22.7	28.9	20.0	6.9	4.3	5.8	4.6	6.1
28	4.7	4.8	26.3	8.0	24.6	27.7	24.8	6.4	4.4	5.8	4.6	5.9
29	3.9	4.7	28.1	8.1	25.9	27.1	28.0	6.4	4.8	5.6	5.0	6.1
30	3.3	4.7	28.4	9.9	.....	27.3	30.4	6.7	5.2	5.5	5.1	5.6
31	2.8	.....	29.0	13.2	.....	28.1	.....	8.5	.....	5.0	4.8	.....

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Daily gage height, in feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1876–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1913.												
1	5.1	1.9	1.4	6.6	30.1	22.5	31.3	6.2	12.7	3.4	2.0	1.4
2	4.8	1.8	1.3	7.9	30.0	25.3	30.7	6.1	11.5	3.3	2.2	1.4
3	4.5	1.8	1.9	8.5	30.0	26.3	30.6	6.0	11.2	3.6	2.4	1.4
4	4.2	1.8	2.4	9.7	29.0	25.8	30.9	5.9	11.2	3.5	2.6	1.4
5	4.0	1.7	2.6	11.8	28.9	25.5	31.4	5.7	10.6	3.0	2.7	1.3
6	3.9	1.6	4.3	12.6	27.1	24.9	31.7	5.5	9.8	2.9	2.5	1.2
7	3.2	1.4	7.9	19.4	24.4	23.6	31.4	5.3	9.1	2.6	2.4	1.0
8	2.9	1.4	9.2	27.4	21.5	21.0	30.0	5.2	9.1	2.4	2.4	1.0
9	2.6	1.5	9.5	29.5	19.0	17.0	27.5	5.0	9.0	2.3	2.4	.9
10	2.1	1.5	10.3	29.6	15.0	13.5	25.9	5.0	9.8	2.6	2.3	1.0
11	2.2	1.8	10.9	29.2	14.0	11.8	25.4	4.9	9.2	2.7	2.3	1.0
12	2.2	1.8	10.4	30.1	16.0	10.5	23.7	4.6	8.2	2.9	2.3	1.0
13	2.0	1.7	9.4	29.8	17.1	9.7	21.8	4.4	7.4	3.4	2.3	.8
14	1.8	1.7	8.0	29.3	18.7	10.6	19.9	4.4	7.4	3.3	2.1	.7
15	1.7	1.5	7.3	28.2	19.2	15.5	18.0	4.6	7.9	3.2	1.7	.6
16	1.6	2.6	6.6	26.6	19.1	21.0	16.2	4.6	7.6	3.1	1.9	.7
17	1.5	2.8	5.2	24.4	19.0	24.0	14.5	4.4	6.9	2.9	2.1	1.0
18	1.6	2.8	4.7	22.5	18.0	24.9	13.1	4.5	6.2	2.8	2.7	1.2
19	1.6	2.6	4.5	22.0	16.3	25.2	12.2	5.0	5.5	2.7	2.8	1.0
20	1.8	2.4	4.1	21.7	14.3	25.4	11.6	5.1	5.0	2.7	2.6	.9
21	2.0	2.4	4.0	21.7	12.4	26.3	11.1	5.0	4.6	2.7	2.5	.8
22	2.2	2.1	3.7	21.3	11.5	27.5	10.4	4.9	4.2	2.4	2.1	.7
23	2.5	1.9	3.6	21.3	10.1	28.0	10.0	5.2	4.0	2.1	2.0	.7
24	2.7	1.7	3.4	22.4	9.4	28.5	9.3	5.8	4.0	2.0	2.0	.7
25	2.6	1.7	5.1	24.2	9.0	28.4	8.7	6.8	4.0	1.9	1.9	.7
26	2.6	1.6	5.8	25.8	8.8	29.4	8.1	8.3	3.9	2.0	1.8	.8
27	2.6	1.5	6.2	27.1	11.5	32.1	7.6	9.3	3.8	2.0	1.8	.8
28	2.5	1.5	5.8	28.1	16.4	33.0	7.0	10.8	3.7	1.8	1.7	1.3
29	2.3	1.5	5.7	28.9	.....	33.3	6.6	13.0	3.6	1.8	1.7	1.7
30	2.1	1.4	5.8	29.6	.....	32.7	6.4	14.0	3.5	1.7	1.6	2.0
31	2.0	.....	6.2	29.9	.....	32.1	.....	13.8	.....	1.7	1.5	.....

Daily discharge, in second feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1890–1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1890.												
1	47,000	18,300	95,800	29,300	.....	.....	.....	98,400	61,200	26,200	46,200	33,800
2	47,000	18,300	84,600	32,500	.....	.....	.....	91,500	62,000	25,600	44,100	30,600
3	37,200	18,700	78,600	32,500	.....	.....	.....	85,500	66,900	23,900	39,900	32,500
4	33,100	19,200	73,500	36,500	.....	.....	.....	77,800	50,600	22,800	33,100	23,900
5	33,100	20,200	76,000	33,800	.....	.....	.....	72,700	45,500	21,700	37,800	25,000
6	31,200	20,700	62,800	39,900	.....	.....	.....	68,500	42,000	21,200	41,300	35,800
7	28,600	21,700	56,500	42,000	.....	.....	.....	65,200	38,500	20,200	32,500	33,100
8	28,600	29,900	54,300	39,900	.....	.....	.....	62,800	37,200	19,700	29,900	29,300
9	28,600	36,500	52,800	37,800	.....	.....	.....	62,800	36,500	19,700	36,500	26,200
10	27,400	38,500	47,700	35,100	.....	.....	.....	64,400	39,900	19,700	35,800	23,900
11	23,300	39,900	43,400	26,800	.....	.....	.....	71,900	44,800	20,200	35,800	24,500
12	21,200	42,000	39,900	26,800	.....	.....	.....	76,000	49,900	21,200	35,800	23,900
13	20,700	51,300	39,200	26,800	.....	.....	.....	75,200	53,500	21,700	37,800	36,500
14	20,200	69,400	36,500	26,200	.....	.....	.....	72,700	44,100	20,200	42,000	28,600
15	17,400	78,600	35,800	38,500	.....	.....	.....	71,900	42,700	19,200	42,700	23,300
16	16,500	82,000	35,100	.....	.....	.....	.....	70,200	37,200	19,700	40,600	23,900
17	16,500	86,300	33,800	.....	.....	.....	.....	62,800	33,800	21,700	38,500	25,000
18	16,500	95,800	30,600	.....	.....	.....	.....	55,800	31,200	21,700	34,400	26,200
19	16,500	107,000	29,300	.....	.....	.....	.....	58,800	30,600	20,200	45,500	26,800
20	16,100	133,000	28,600	.....	.....	.....	70,200	62,800	29,300	19,200	29,300	27,400
21	15,700	141,000	28,000	.....	.....	.....	78,600	71,900	28,600	18,300	26,200	28,000
22	15,700	141,000	28,000	.....	.....	.....	101,000	72,700	28,000	18,700	25,000	28,600
23	15,700	137,000	28,000	.....	.....	.....	104,000	76,000	26,200	19,200	17,800	29,300
24	15,700	130,000	28,000	.....	.....	.....	133,000	78,600	25,600	24,500	17,800	38,500
25	15,700	121,000	26,800	.....	.....	.....	140,000	82,900	25,000	26,200	21,700	53,500
26	15,700	111,000	26,200	.....	.....	.....	133,000	89,800	24,500	27,400	20,700	56,500
27	15,700	107,000	25,600	.....	.....	.....	123,000	96,700	24,500	36,500	20,700	59,600
28	15,700	106,000	25,600	.....	.....	.....	120,000	105,000	25,600	44,100	21,200	54,300
29	16,500	106,000	26,200	.....	.....	.....	118,000	91,500	26,200	36,500	22,800	50,600
30	17,400	103,000	26,800	.....	.....	.....	109,000	82,000	26,200	39,900	32,500	44,800
31	18,300	.....	28,000	.....	.....	.....	.....	81,200	.....	44,800	33,800	.....

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Daily discharge, in second feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1890–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1891.												
1	40,600	58,100	20,200	89,800	166,000	.....	.....	60,400	26,800	42,000	33,100	46,200
2	37,200	54,300	19,700	90,600	181,000	.....	.....	57,300	26,800	37,200	46,200	42,700
3	33,800	47,700	19,200	109,000	194,000	.....	.....	55,000	25,000	31,800	55,800	39,200
4	36,500	39,200	19,200	109,000	211,000	.....	.....	51,300	29,900	28,600	85,500	36,500
5	39,200	43,400	19,200	96,700	227,000	.....	.....	47,700	33,800	26,800	92,400	33,800
6	39,900	39,200	19,200	90,600	229,000	.....	.....	40,600	33,800	25,600	101,000	31,200
7	55,800	33,800	33,800	100,000	232,000	.....	.....	42,700	32,500	24,500	113,000	28,000
8	52,800	33,100	29,300	110,000	235,000	.....	.....	40,600	31,800	24,500	111,000	26,200
9	48,400	32,500	29,300	113,000	238,000	.....	.....	38,500	29,300	24,500	109,000	21,200
10	43,400	31,800	29,300	104,000	241,000	.....	.....	37,200	28,000	25,000	88,100	27,400
11	39,900	29,900	29,300	96,700	250,000	.....	.....	35,800	31,200	25,000	55,000	29,300
12	40,600	27,400	31,800	89,800	259,000	.....	.....	33,800	36,500	25,000	44,800	30,600
13	40,600	26,800	33,100	105,000	275,000	.....	.....	33,100	36,500	25,000	38,500	30,600
14	42,000	26,200	46,200	102,000	271,000	.....	.....	31,800	37,800	25,000	35,100	30,600
15	33,100	25,000	52,800	104,000	277,000	.....	.....	31,200	38,500	26,200	31,800	28,000
16	30,600	24,500	50,600	105,000	284,000	.....	.....	30,600	39,900	28,000	30,600	26,200
17	28,000	24,500	50,600	105,000	287,000	.....	.....	29,900	49,100	26,200	28,000	25,000
18	28,000	29,900	39,200	104,000	289,000	.....	.....	29,300	50,600	25,600	26,800	23,300
19	26,800	31,200	39,200	102,000	290,000	.....	.....	28,600	44,800	25,000	26,200	21,700
20	26,200	29,300	31,800	88,900	292,000	.....	.....	28,000	47,000	25,000	24,500	21,200
21	25,000	26,800	29,900	82,000	295,000	.....	.....	27,400	48,400	22,800	23,900	20,700
22	26,000	26,200	28,000	75,200	299,000	.....	.....	30,600	47,000	20,700	23,300	20,200
23	26,200	26,200	26,200	76,900	302,000	.....	.....	31,200	52,100	20,200	23,300	19,700
24	32,500	26,200	25,600	88,900	302,000	.....	88,900	30,600	55,000	23,900	23,300	19,200
25	37,200	23,300	26,800	104,000	301,000	.....	88,100	29,900	56,500	26,200	22,800	18,300
26	38,500	22,800	29,300	126,000	294,000	.....	85,500	28,600	52,800	26,200	22,800	17,400
27	45,500	22,200	33,100	128,000	285,000	.....	82,000	28,600	41,300	25,600	25,000	17,000
28	49,100	21,700	36,500	157,000	277,000	.....	88,900	35,800	40,000	25,600	27,400	16,500
29	58,800	21,200	43,400	158,000	.....	.....	71,000	37,200	39,900	25,000	32,500	16,100
30	62,000	21,200	50,600	150,000	.....	.....	74,400	46,200	42,700	23,900	39,900	15,700
31	62,000	.....	78,600	146,000	.....	.....	.....	46,200	.....	27,400	45,500	.....
1892.												
1	14,900	12,600	39,900	100,000	86,300	73,500	97,500	.....	54,300	44,800	31,800	29,900
2	14,500	12,600	36,500	93,200	82,900	65,200	96,700	.....	51,300	39,200	31,800	29,900
3	14,900	12,600	33,100	86,300	73,500	59,600	118,000	.....	62,800	39,900	33,800	28,000
4	14,500	12,600	32,500	85,500	58,100	57,300	149,000	.....	62,800	45,500	34,400	26,200
5	14,100	12,600	30,600	82,000	52,100	52,100	165,000	.....	72,700	45,500	31,800	25,000
6	14,500	12,600	36,500	80,300	49,100	47,700	.....	.....	79,500	52,800	30,600	25,000
7	14,500	12,600	47,700	76,900	49,100	47,700	.....	.....	70,200	55,800	29,300	26,200
8	14,500	12,600	48,400	76,900	68,500	47,000	.....	70,200	68,500	59,600	28,600	26,200
9	14,100	12,600	56,500	74,400	94,100	46,200	.....	65,200	75,200	75,200	28,600	28,000
10	14,100	12,600	62,800	74,400	110,000	60,400	.....	72,700	77,800	116,000	29,300	24,500
11	14,100	12,900	66,500	74,400	113,000	66,900	.....	72,700	75,200	163,000	29,300	20,700
12	13,700	14,100	73,500	77,800	114,000	67,700	.....	79,500	70,200	176,000	28,600	19,200
13	13,700	16,500	75,200	85,500	109,000	66,100	.....	82,900	65,200	168,000	35,800	19,200
14	13,700	17,000	76,000	98,400	109,000	65,200	.....	55,800	62,000	155,000	37,200	27,400
15	13,700	16,500	71,000	126,000	108,000	68,500	.....	49,900	58,100	136,000	31,800	26,800
16	13,700	15,300	62,800	151,000	105,000	70,200	.....	50,600	55,800	124,000	26,800	25,000
17	13,700	15,300	55,000	167,000	100,000	66,900	.....	47,700	53,500	113,000	25,000	23,300
18	13,700	17,400	49,100	179,000	91,500	65,200	.....	44,100	47,700	106,000	24,500	21,200
19	13,700	21,200	42,000	190,000	82,900	65,200	.....	49,100	41,300	97,500	23,900	19,700
20	13,700	23,900	38,500	199,000	83,800	69,400	.....	59,600	38,500	83,800	25,600	19,200
21	13,700	23,300	37,200	203,000	87,200	82,900	.....	66,100	35,800	75,200	25,600	21,200
22	13,700	23,300	35,800	218,000	96,700	88,900	.....	66,100	34,400	70,200	25,600	28,600
23	13,300	28,000	42,700	230,000	108,000	103,000	.....	62,800	34,400	65,200	26,200	36,500
24	13,300	34,400	52,100	234,000	115,000	123,000	.....	61,200	35,100	53,500	23,900	36,500
25	13,300	34,400	55,800	237,000	115,000	110,000	.....	59,600	45,500	53,500	23,300	33,800
26	13,300	37,200	58,800	239,000	109,000	113,000	.....	58,100	49,100	49,900	23,900	30,600
27	12,900	32,500	62,000	233,000	101,000	110,000	.....	54,300	52,800	45,500	28,600	28,600
28	12,900	31,200	68,500	217,000	87,200	104,000	.....	53,500	55,800	42,700	29,300	27,400
29	12,900	32,500	83,800	189,000	81,200	104,000	.....	55,800	54,300	38,500	29,300	23,900
30	12,600	39,900	90,600	146,000	.....	104,000	.....	63,600	47,700	36,500	28,000	21,700
31	12,600	.....	94,100	113,000	.....	98,400	.....	66,900	.....	33,100	28,000	.....

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Daily discharge, in second feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1890–1915—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1893.												
1	21,700	12,900	32,500	88,900	33,800	268,000	56,500	103,000	140,000	37,200	20,200	13,700
2	22,200	12,900	34,400	92,400	41,300	248,000	52,800	113,000	174,000	30,600	19,200	13,300
3	23,300	12,900	37,800	96,700	41,300	237,000	46,200	122,000	208,000	30,600	19,200	23,300
4	22,200	13,700	39,200	72,700	73,500	195,000	44,100	131,000	212,000	28,600	18,300	23,300
5	19,700	14,500	39,900	66,900	74,400	150,000	43,400	141,000	199,000	28,000	18,700	23,300
6	18,300	14,900	40,600	58,100	74,400	113,000	43,400	159,000	178,000	26,200	18,300	25,000
7	17,400	14,100	39,200	54,300	73,500	108,000	42,700	180,000	187,000	25,600	18,300	31,800
8	16,500	14,500	39,900	50,600	70,200	97,500	42,000	190,000	192,000	31,800	18,700	31,800
9	16,100	15,300	38,500	42,000	55,800	94,100	87,200	202,000	202,000	27,400	19,700	31,800
10	16,100	14,900	37,800	45,500	55,800	87,200	127,000	209,000	201,000	26,200	20,200	29,900
11	15,700	15,300	36,500	36,500	53,500	85,500	127,000	213,000	190,000	25,600	20,700	28,600
12	15,300	20,200	35,800	35,100	54,300	94,100	157,000	219,000	185,000	25,600	21,200	26,800
13	14,900	21,200	35,100	34,400	76,900	103,000	127,000	221,000	181,000	24,500	21,200	28,600
14	14,900	27,400	61,200	33,100	103,000	114,000	107,000	212,000	158,000	23,300	21,700	29,900
15	14,900	34,400	63,600	31,200	127,000	118,000	161,000	192,000	141,000	23,300	21,700	30,600
16	14,900	36,500	65,200	28,000	154,000	118,000	199,000	163,000	130,000	22,200	21,700	30,600
17	14,500	37,200	103,000	27,400	190,000	115,000	242,000	139,000	95,800	21,200	21,200	29,900
18	14,500	33,800	118,000	38,500	227,000	109,000	247,000	122,000	71,000	20,200	21,200	55,000
19	14,500	32,500	135,000	24,500	248,000	95,800	239,000	109,000	51,300	20,200	19,700	63,600
20	14,500	33,100	132,000	23,900	266,000	82,000	221,000	85,500	44,100	20,200	19,200	60,400
21	14,100	35,800	126,000	21,700	278,000	73,500	192,000	80,300	43,400	19,700	18,700	52,100
22	13,700	39,200	131,000	21,700	280,000	63,600	168,000	75,200	42,700	19,200	20,200	43,400
23	13,700	40,600	133,000	21,700	279,000	62,800	131,000	71,000	40,600	18,700	25,000	36,500
24	13,700	39,900	127,000	21,700	279,000	66,100	97,500	62,800	39,200	18,700	25,600	29,900
25	13,700	36,500	120,000	22,200	280,000	59,600	85,500	58,100	37,800	19,200	23,300	27,400
26	13,700	33,100	113,000	22,800	280,000	59,600	77,800	55,800	37,200	19,200	17,400	26,200
27	13,700	33,800	103,000	25,000	279,000	59,600	81,200	49,900	37,200	21,700	17,400	23,900
28	13,300	36,500	83,800	29,300	276,000	62,000	90,600	51,300	38,500	24,500	16,500	22,200
29	12,900	37,800	70,200	26,800	.....	63,600	95,800	53,500	39,200	25,600	16,100	21,200
30	12,900	33,100	62,800	34,400	.....	60,400	99,300	75,200	39,900	25,600	14,900	20,200
31	12,900	.....	51,300	33,800	.....	58,100	.....	87,200	.....	22,200	14,100	.....
1894.												
1	19,200	21,700	17,400	19,700	47,700	76,000	66,900	31,800	31,800	17,000	22,200	20,200
2	18,700	21,700	17,800	19,200	44,100	76,900	58,100	30,600	29,900	16,500	21,200	19,200
3	18,300	20,700	18,700	19,200	42,700	76,000	76,000	29,300	27,400	16,500	21,200	18,300
4	17,800	20,200	19,700	19,700	98,400	73,500	81,200	28,600	25,600	17,800	21,700	17,800
5	16,500	19,700	20,200	20,700	163,000	71,900	104,000	29,300	23,900	20,700	21,700	18,700
6	16,100	19,200	23,300	25,600	194,000	76,900	110,000	29,300	22,200	22,800	20,200	19,700
7	15,700	18,700	31,800	26,800	201,000	86,300	110,000	28,000	21,200	24,500	18,700	19,700
8	14,900	18,300	29,900	41,300	215,000	93,200	100,000	28,600	20,700	26,800	17,800	18,700
9	16,100	17,000	28,600	47,000	239,000	93,100	88,900	29,900	20,200	28,600	17,400	17,800
10	15,300	16,500	28,000	46,200	248,000	90,600	93,200	31,800	19,200	26,800	17,000	15,700
11	15,700	16,100	29,300	55,000	257,000	83,800	107,000	31,800	18,700	23,900	17,000	14,900
12	16,100	15,700	28,000	79,500	257,000	77,800	104,000	30,600	17,400	21,200	17,000	14,900
13	16,500	15,300	26,800	99,300	258,000	73,500	95,800	29,900	17,000	25,000	16,500	14,900
14	17,400	14,900	25,600	99,300	258,000	70,200	86,300	30,600	16,500	19,200	16,100	14,500
15	16,500	15,700	25,000	88,100	254,000	66,900	82,000	31,200	16,100	19,200	16,100	13,700
16	16,500	16,100	25,600	83,800	247,000	63,600	77,800	33,800	16,100	20,200	15,700	13,700
17	16,500	19,200	29,300	88,900	218,000	62,800	74,400	35,100	16,100	20,200	14,900	13,700
18	16,100	25,600	33,800	98,400	218,000	71,000	69,400	33,800	15,700	19,200	14,100	13,700
19	20,000	19,200	35,100	86,300	218,000	82,000	62,800	31,200	16,100	18,300	14,100	14,100
20	29,900	18,300	31,800	77,800	142,000	104,000	61,200	29,300	16,100	19,200	14,100	15,300
21	27,400	17,800	29,900	64,400	124,000	117,000	55,800	27,400	16,100	21,700	17,000	15,700
22	37,800	17,800	29,300	76,000	109,000	117,000	50,600	29,300	16,100	22,200	20,700	15,700
23	33,100	18,300	25,000	78,600	101,000	118,000	46,200	30,600	16,100	20,700	20,200	15,700
24	29,300	18,700	25,000	77,800	94,100	123,000	43,400	31,200	16,100	19,200	21,200	15,300
25	25,000	18,700	24,500	76,000	88,100	134,000	40,600	32,500	19,200	19,200	22,200	14,500
26	22,200	17,800	24,500	74,400	83,800	136,000	38,500	35,800	17,400	20,700	24,500	13,300
27	19,700	17,800	23,300	66,100	80,300	126,000	35,800	39,200	17,400	21,700	28,000	12,600
28	18,700	17,400	22,200	66,100	78,600	115,000	35,100	40,600	17,400	22,200	29,300	12,600
29	18,700	17,400	21,200	55,800	.....	101,000	34,400	39,900	17,800	21,200	26,200	12,600
30	18,700	17,400	20,200	52,100	.....	77,800	32,500	37,800	17,400	22,200	23,900	12,600
31	18,300	.....	19,700	49,900	.....	66,900	.....	35,100	.....	22,800	21,700	.....

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Daily discharge, in second feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1890–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1895.												
1	12,200	9,940	10,800	40,600	85,500	51,300	107,000	57,300	55,800	19,200	44,100	23,900
2	11,500	9,940	10,800	47,000	88,900	52,100	83,800	55,000	52,100	19,200	51,300	22,800
3	11,200	9,650	10,800	44,800	82,900	55,800	82,000	52,100	47,000	19,200	44,800	21,200
4	10,500	9,650	10,800	38,500	76,000	71,900	74,400	49,900	42,700	22,800	36,500	21,200
5	10,500	9,650	11,200	32,500	71,900	88,900	67,700	47,000	39,200	33,100	29,900	21,200
6	10,200	9,940	11,200	29,300	68,500	104,000	62,000	44,100	37,800	37,800	25,600	20,700
7	10,200	10,500	11,200	26,200	66,900	122,000	57,300	46,200	33,800	39,200	25,000	20,200
8	10,200	11,200	11,200	28,000	64,400	136,000	56,500	42,000	30,600	41,300	21,200	19,700
9	10,200	11,800	11,800	43,400	66,100	147,000	60,400	39,900	28,600	43,400	20,200	19,200
10	10,800	11,800	12,600	70,200	68,500	147,000	71,000	47,700	27,400	46,200	19,700	18,700
11	11,200	11,500	13,700	85,500	65,200	133,000	86,300	52,100	26,800	46,200	18,300	18,300
12	11,500	11,500	13,300	108,000	62,800	113,000	94,100	56,500	28,000	50,600	19,200	20,700
13	11,500	11,200	14,500	133,000	55,000	103,000	96,700	61,200	28,600	49,900	19,700	21,200
14	11,200	10,800	15,700	151,000	47,700	90,600	98,400	64,400	28,000	46,200	20,200	19,700
15	10,800	10,800	17,400	164,000	42,000	97,500	97,500	63,600	26,200	42,000	20,200	17,800
16	10,500	10,500	26,200	168,000	38,500	116,000	92,400	62,000	24,500	37,800	18,300	16,500
17	10,200	10,500	49,900	190,000	36,500	116,000	82,900	61,200	23,900	35,800	18,300	15,700
18	10,200	10,500	62,000	201,000	35,100	126,000	76,000	60,400	22,800	33,800	18,300	16,100
19	10,500	10,800	63,600	207,000	34,400	122,000	73,500	58,100	22,200	30,600	20,700	17,800
20	11,800	10,800	57,300	208,000	35,100	132,000	68,500	55,000	21,700	29,900	18,300	18,700
21	12,600	10,800	47,700	188,000	35,800	160,000	67,700	51,300	22,200	31,200	18,300	17,800
22	12,200	10,800	38,500	167,000	37,800	186,000	76,900	47,000	22,800	29,300	19,700	16,500
23	11,800	10,500	31,800	153,000	40,600	200,000	83,800	44,800	22,800	25,000	26,200	15,700
24	11,200	10,500	27,400	144,000	43,400	190,000	81,200	43,400	21,700	23,900	35,100	14,900
25	10,800	10,800	23,900	133,000	45,500	194,000	73,500	42,700	20,700	22,800	37,800	14,100
26	10,500	10,800	22,200	124,000	46,200	194,000	62,000	42,000	20,700	21,700	36,500	13,700
27	10,200	10,800	21,700	118,000	49,100	194,000	59,600	39,900	20,700	21,200	34,400	13,300
28	10,200	10,800	20,700	118,000	51,300	193,000	58,100	41,300	20,200	19,700	31,200	13,300
29	9,940	10,800	23,300	118,000	.....	185,000	59,600	48,400	19,700	18,700	28,600	12,200
30	9,940	10,800	25,000	109,000	.....	163,000	59,600	56,500	19,200	18,300	27,400	11,800
31	9,940	.....	29,300	101,000	.....	135,000	.....	58,800	.....	20,700	26,200	.....
1896.												
1	11,200	9,370	11,800	51,300	54,300	39,900	92,400	49,100	23,900	21,700	68,500	15,300
2	10,800	9,650	12,200	47,000	89,800	39,900	122,000	50,600	23,900	18,700	58,100	15,300
3	10,500	9,940	12,200	44,100	157,000	39,200	155,000	50,600	22,800	17,800	48,400	18,300
4	10,500	9,940	13,300	41,300	194,000	37,800	181,000	47,700	21,200	17,400	39,900	18,700
5	10,200	9,940	13,700	39,200	211,000	36,500	195,000	43,400	20,200	18,700	34,400	17,400
6	10,200	10,200	14,100	37,800	216,000	37,800	202,000	40,600	19,700	24,500	30,600	16,100
7	9,940	10,200	13,700	36,500	206,000	49,100	207,000	38,500	21,700	28,000	28,000	14,900
8	9,940	10,200	13,300	35,800	193,000	60,400	212,000	35,800	26,800	28,000	26,800	13,700
9	9,940	10,800	12,900	36,500	176,000	62,800	217,000	34,400	31,800	26,800	25,600	13,300
10	9,650	11,200	12,600	37,200	167,000	58,800	222,000	34,400	33,100	26,200	25,600	12,600
11	9,650	11,800	12,600	37,800	165,000	51,300	229,000	33,100	31,200	26,200	25,600	11,800
12	9,650	12,200	12,600	35,100	164,000	45,500	232,000	31,800	28,600	30,600	25,000	11,500
13	9,650	12,200	12,900	33,800	158,000	41,300	227,000	29,900	28,000	54,300	22,800	11,500
14	9,650	12,200	12,900	31,200	158,000	39,200	201,000	28,600	29,900	89,800	21,200	12,600
15	9,650	11,800	12,600	29,300	160,000	39,900	152,000	26,200	36,500	115,000	19,700	13,700
16	9,650	11,800	12,600	27,400	162,000	43,400	103,000	24,500	37,800	122,000	18,700	14,100
17	9,650	11,500	12,600	26,200	158,000	66,900	73,500	22,800	36,500	112,000	18,300	13,700
18	9,650	12,200	12,600	25,000	151,000	98,400	58,100	20,700	30,600	98,400	18,300	12,900
19	9,650	13,300	12,600	22,800	144,000	118,000	49,900	20,700	28,600	95,800	17,800	12,200
20	9,650	13,700	13,300	23,300	133,000	133,000	45,500	20,700	25,600	91,500	17,800	11,500
21	9,650	13,700	13,700	23,800	118,000	150,000	42,000	20,700	22,800	88,900	17,400	11,200
22	9,650	13,300	13,700	22,200	98,400	163,000	39,200	20,700	21,200	88,900	17,000	11,200
23	9,650	12,600	13,700	21,700	82,900	166,000	38,500	20,200	20,200	84,600	17,000	10,800
24	9,650	12,600	13,700	22,200	70,200	163,000	37,200	20,200	19,700	71,000	17,000	10,500
25	9,650	12,200	13,700	23,900	60,400	153,000	36,500	19,700	20,700	57,300	16,500	10,500
26	9,650	11,800	13,700	28,000	55,000	136,000	35,100	19,200	21,200	49,100	16,100	10,500
27	9,650	11,800	19,700	33,100	47,700	118,000	37,200	19,200	22,800	50,600	15,700	10,200
28	9,370	11,800	58,800	39,200	42,700	100,000	42,000	20,200	21,700	54,300	15,300	10,500
29	9,370	11,800	86,300	37,800	40,600	86,300	48,400	22,800	23,900	53,500	14,900	10,500
30	9,370	11,800	77,800	53,500	.....	78,600	51,300	23,900	24,500	55,000	14,900	10,800
31	9,370	.....	60,400	54,300	.....	75,200	.....	24,500	.....	55,200	14,900	.....

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Daily discharge, in second feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1890–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1897.												
1	11,900	10,200	78,600	20,700	49,600	174,000		56,500	29,900	31,800	55,800	16,500
2	12,900	10,200	77,900	20,200	36,500	195,000		56,500	29,300	31,800	44,800	16,100
3	13,700	10,200	72,700	19,700	39,200	195,000		52,800	28,000	32,500	36,500	16,100
4	13,300	10,200	77,900	19,200	49,100	208,000		49,100	27,400	31,200	31,200	15,300
5	12,900	10,200	85,500	21,200	55,800	212,000		47,000	26,800	28,600	27,400	14,900
6	13,700	10,200	90,600	23,300	74,400	202,000		47,000	26,800	26,800	24,500	13,700
7	14,100	10,200	87,200	25,600	87,200	184,000		52,800	26,800	25,000	22,800	12,900
8	14,500	10,400	74,400	25,600	101,000	184,000		61,200	25,800	24,500	22,800	12,900
9	14,500	11,500	59,600	25,000	110,000	194,000		61,200	25,800	23,800	23,300	12,600
10	14,900	11,500	49,900	24,500	113,000	205,000		58,100	26,200	22,800	22,200	11,800
11	14,900	11,200	42,000	23,900	116,000	215,000		54,300	25,600	22,800	22,800	11,800
12	14,100	11,800	36,500	23,300	120,000	227,000		52,800	25,600	22,800	23,900	11,500
13	13,300	17,400	33,100	22,800	124,000	241,000		54,300	26,200	23,900	24,500	11,500
14	12,600	26,200	31,800	23,300	125,000	258,000		67,700	25,600	25,600	27,400	11,200
15	11,800	32,500	33,800	24,500	117,000	273,000		88,100	27,400	25,600	29,300	10,800
16	11,200	29,900	36,500	26,800	105,000	281,000		111,000	30,600	26,200	27,400	10,500
17	10,900	34,400	41,300	29,900	93,300	291,000		131,000	31,200	26,200	25,000	10,500
18	10,500	38,500	43,400	39,900	88,900	302,000		144,100	28,600	25,600	22,800	10,200
19	10,500	37,800	41,300	52,800	86,300	315,000		153,000	25,600	25,600	20,700	9,940
20	10,200	33,800	37,200	67,700	86,300	342,000		153,000	23,900	25,000	18,700	9,650
21	10,200	29,900	35,100	74,400	76,000	371,000		141,000	22,800	28,000	17,400	9,650
22	10,400	26,200	31,200	75,200	71,000	398,000		115,000	22,800	36,500	17,400	9,650
23	11,200	23,900	29,300	75,200	73,500	404,000		87,200	21,700	40,600	17,400	9,650
24	11,500	21,200	30,600	73,500	82,000	410,000	77,800	66,100	20,700	39,900	17,800	9,370
25	11,500	19,200	30,600	72,700	91,500	407,000	69,400	54,300	21,200	38,500	17,800	9,370
26	11,500	18,700	29,900	66,900	113,000	402,000	66,100	47,000	23,900	37,800	17,800	9,080
27	11,500	18,700	29,900	69,400	140,000	397,000	58,800	42,700	26,200	35,800	17,800	9,080
28	10,800	26,200	25,600	56,500	158,000	389,000	54,300	39,200	27,400	37,200	17,800	9,080
29	10,400	43,400	21,700	44,100	.....	380,000	50,600	36,500	29,300	47,700	18,300	9,080
30	10,500	60,400	22,800	43,400	.....	370,000	48,400	35,100	31,800	63,600	18,300	9,080
31	10,200	.....	21,700	42,000	.....	356,000	.....	31,800	.....	66,100	17,000	.....
1898.												
1	9,090	11,200	9,370	42,000	.....	28,600	.....	62,000	26,200	21,200	36,500	21,700
2	9,090	11,200	9,370	36,500	.....	29,300	.....	60,400	25,600	18,700	39,200	21,200
3	8,820	10,800	9,650	32,500	.....	29,300	.....	58,100	26,800	17,800	39,200	21,200
4	8,820	10,500	10,500	29,900	.....	28,000	.....	54,300	24,500	16,500	47,000	21,200
5	8,820	9,940	14,100	27,400	.....	26,800	.....	50,600	21,700	16,500	51,300	20,700
6	8,560	9,650	20,200	26,200	.....	25,000	.....	47,000	20,700	16,100	50,600	20,200
7	8,560	9,650	23,900	24,500	.....	24,500	.....	44,100	19,200	16,100	44,800	52,800
8	8,560	9,650	24,500	23,300	52,800	23,300	.....	41,300	18,700	16,100	37,200	95,800
9	8,560	9,650	25,000	22,800	44,800	23,300	.....	38,500	17,800	15,300	39,900	118,000
10	8,560	10,200	25,600	21,700	39,900	22,800	.....	35,800	15,700	17,400	69,400	126,000
11	8,560	10,500	25,000	21,700	36,500	23,300	.....	33,100	14,900	18,300	95,800	117,000
12	8,560	10,800	23,900	44,800	35,100	23,300	.....	31,200	15,300	16,500	101,000	93,200
13	8,560	11,200	22,200	49,900	33,800	23,300	.....	29,300	15,300	15,300	89,800	71,000
14	8,560	11,200	20,700	55,000	33,100	23,900	.....	28,600	14,500	15,700	76,000	54,300
15	8,560	10,800	19,700	94,100	31,800	26,800	.....	28,000	14,500	16,500	71,900	45,500
16	8,560	10,500	18,700	139,000	30,600	31,800	101,000	28,000	14,100	14,100	81,200	39,200
17	8,560	10,500	17,800	178,000	29,300	38,500	91,500	28,000	14,500	19,200	92,400	34,400
18	8,560	10,800	17,400	.....	28,600	52,800	85,500	26,800	15,300	19,200	98,400	30,600
19	8,560	10,800	16,500	.....	28,000	58,800	81,200	25,600	15,700	18,700	93,200	27,400
20	8,560	10,800	18,700	.....	27,400	61,200	82,000	24,500	15,700	18,300	79,500	25,000
21	9,370	10,800	33,100	.....	26,800	59,600	103,000	23,900	15,700	20,200	62,000	23,300
22	9,650	10,500	54,300	.....	25,600	55,800	117,000	32,500	16,100	25,000	51,300	22,800
23	9,940	9,940	80,300	.....	25,000	52,800	114,000	31,800	16,500	26,200	40,600	22,200
24	10,200	9,650	94,100	.....	24,500	51,300	104,000	23,300	18,300	24,500	36,500	21,700
25	10,200	9,650	98,400	.....	23,900	.....	90,600	26,800	23,300	23,900	33,800	21,700
26	10,500	9,650	98,400	.....	23,900	.....	81,200	25,000	30,600	22,200	32,500	21,200
27	10,500	9,650	94,900	.....	23,300	.....	76,000	23,300	32,500	21,200	30,900	22,200
28	11,500	9,370	86,300	.....	26,800	.....	73,500	21,700	31,200	23,300	29,900	25,600
29	11,200	9,090	69,400	.....	.....	.....	69,400	21,200	27,400	26,800	26,200	29,300
30	11,200	9,090	57,300	.....	.....	.....	65,200	21,200	24,500	30,600	25,000	33,800
31	10,800	.....	48,400	.....	.....	.....	.....	22,800	.....	30,600	22,200	.....

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Daily discharge, in second feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1890–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1899.												
1	35,100	37,800	37,200	35,100	57,300	205,000	.....	89,800	26,800	17,400	21,700	11,500
2	31,800	33,100	33,800	34,400	52,100	212,000	.....	80,300	25,600	17,400	21,700	11,200
3	26,800	31,200	32,500	34,400	53,500	211,000	.....	69,400	25,000	18,700	23,900	10,800
4	23,900	28,600	32,500	33,800	58,100	207,000	.....	62,000	25,000	19,200	24,500	10,500
5	21,700	26,200	31,800	36,500	83,800	217,000	.....	59,600	24,500	18,700	25,000	11,800
6	19,700	25,000	32,500	44,800	131,000	211,000	.....	52,800	23,900	18,700	23,900	12,600
7	19,200	24,500	34,400	75,200	175,000	208,000	.....	48,400	23,900	18,300	21,200	12,200
8	19,200	23,300	35,100	126,000	202,000	192,000	.....	46,200	24,500	18,300	19,200	13,700
9	46,200	22,200	36,500	159,000	218,000	183,000	.....	44,100	25,600	17,400	17,800	14,900
10	79,500	23,300	37,200	179,000	222,000	184,000	.....	47,000	25,600	16,100	17,000	14,100
11	88,900	23,900	38,500	188,000	224,000	188,000	.....	54,300	24,500	15,300	16,100	14,100
12	77,800	25,000	37,800	186,000	228,000	193,000	.....	61,200	23,900	14,900	16,100	13,700
13	62,800	25,600	36,500	186,000	230,000	198,000	.....	73,500	22,800	14,900	15,700	12,900
14	53,500	25,600	34,400	193,000	234,000	194,000	.....	79,500	21,700	15,700	15,300	12,600
15	44,800	26,200	33,100	181,000	238,000	188,000	.....	79,500	21,200	15,300	15,300	12,200
16	39,900	26,800	29,900	158,000	242,000	204,000	.....	75,200	22,200	14,900	14,900	11,500
17	35,100	28,600	28,600	135,000	244,000	226,000	.....	67,700	24,500	14,900	14,500	11,500
18	33,100	26,800	26,800	116,000	242,000	241,000	99,300	63,600	28,600	14,500	14,100	11,500
19	31,200	26,800	26,200	102,000	224,000	259,000	80,800	61,200	31,800	14,500	14,500	11,500
20	29,900	26,200	29,900	91,500	177,000	274,000	81,200	58,800	33,100	14,100	14,100	11,800
21	28,000	25,000	29,900	82,900	163,000	287,000	73,500	55,800	33,800	13,700	14,100	11,800
22	29,300	25,000	33,100	75,200	140,000	300,000	67,700	50,600	33,800	13,700	14,500	11,500
23	34,400	27,400	39,200	62,000	129,000	307,000	62,800	45,500	31,200	13,700	15,700	10,800
24	44,100	31,800	44,800	69,400	125,000	313,000	62,000	40,600	28,000	15,700	15,700	10,800
25	53,500	38,500	47,000	75,200	117,000	319,000	70,200	38,500	25,600	19,200	14,500	10,500
26	54,300	44,100	44,800	73,500	122,000	321,000	83,800	35,800	23,900	19,700	13,700	10,200
27	50,600	46,200	41,300	81,200	151,000	324,000	103,000	33,100	21,700	20,700	13,300	9,940
28	45,500	44,800	37,800	82,900	185,000	326,000	106,000	31,800	20,700	21,200	12,900	9,650
29	44,800	43,400	36,500	79,500	.....	330,000	104,000	29,900	19,200	23,900	12,200	9,650
30	41,300	39,900	35,100	71,900	.....	333,000	98,400	28,600	18,700	24,500	12,200	9,940
31	39,900	.....	35,100	65,200	.....	335,000	.....	27,400	.....	23,300	11,500	.....
1900.												
1	10,200	9,650	14,100	45,500	36,500	84,600	98,400	98,400	29,900	235,000	39,900	17,800
2	10,200	9,650	14,100	41,300	33,800	89,800	89,800	85,500	29,900	217,000	48,400	20,200
3	10,200	9,370	14,100	36,500	31,200	95,800	79,500	75,200	31,200	190,000	50,600	20,200
4	9,940	9,370	13,700	32,500	29,300	95,800	75,200	67,700	34,400	156,000	47,000	19,200
5	9,940	9,370	13,300	28,600	26,800	93,200	70,200	58,100	41,300	131,000	41,300	17,800
6	9,940	9,370	13,300	25,000	25,000	91,500	66,100	52,100	52,100	111,000	36,500	17,000
7	9,940	9,370	12,600	21,700	28,000	97,500	64,400	47,000	61,200	88,900	31,800	15,700
8	9,940	9,650	12,200	19,700	33,800	107,000	64,400	42,700	75,200	70,200	28,000	15,300
9	9,650	9,650	12,200	18,300	70,200	118,000	66,900	41,300	83,800	58,800	25,600	15,300
10	9,650	9,650	12,200	17,400	76,000	128,000	67,700	39,900	83,800	50,600	24,500	14,900
11	9,370	9,650	12,900	16,500	76,900	133,000	72,700	39,200	80,300	44,800	20,700	14,500
12	9,370	10,200	15,300	22,200	82,900	137,000	107,000	37,200	73,500	41,300	19,700	13,700
13	9,370	10,500	36,500	37,200	82,900	141,000	139,000	34,400	66,100	37,200	18,300	12,900
14	9,650	10,800	49,100	59,600	91,500	142,000	151,000	32,500	59,600	35,100	16,500	12,200
15	9,650	10,500	55,000	71,900	113,000	139,000	150,000	31,200	71,000	34,400	16,100	11,800
16	9,940	10,500	62,000	78,600	133,000	127,000	136,000	29,300	79,500	33,100	15,700	11,500
17	10,800	10,500	63,600	82,000	149,000	111,000	118,000	28,000	77,800	31,200	15,300	11,200
18	11,500	10,200	58,800	77,800	160,000	94,100	115,000	27,400	74,400	28,600	14,900	11,200
19	11,500	10,200	53,500	73,500	167,000	82,000	162,000	26,800	71,000	26,800	14,900	11,800
20	11,500	9,940	53,500	69,400	169,000	77,800	194,000	26,800	69,400	26,200	14,500	12,600
21	11,200	9,940	59,600	76,000	163,000	81,200	218,000	26,800	63,600	25,600	15,300	15,700
22	10,800	9,940	62,000	86,300	146,000	95,800	230,000	26,200	63,600	29,900	16,100	20,200
23	10,500	9,940	56,500	95,800	119,000	104,000	240,000	26,200	83,800	27,400	15,700	23,900
24	10,200	10,200	55,000	98,400	100,000	109,000	238,000	23,300	101,000	25,600	15,300	26,200
25	10,200	10,500	62,000	93,200	91,500	118,000	230,000	33,100	127,000	25,000	14,900	26,200
26	9,940	10,500	71,000	83,800	87,200	133,000	217,000	33,800	152,000	26,200	16,500	23,900
27	9,650	10,800	72,700	74,400	86,300	145,000	194,000	31,200	193,000	26,200	15,700	21,700
28	9,650	11,500	71,900	61,200	85,500	146,000	168,000	28,000	218,000	25,600	14,900	17,800
29	9,650	12,600	65,200	54,300	.....	135,000	142,000	25,600	240,000	37,200	14,500	15,700
30	9,650	13,700	58,100	47,000	.....	120,000	118,000	26,200	243,000	47,000	14,500	14,900
31	9,650	.....	51,300	41,300	.....	108,000	.....	28,000	.....	38,500	15,300	.....

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Daily discharge, in second feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1890–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1901.												
1	15,700	33,800	108,000	43,400	63,600	29,900	137,000	169,000	176,000	55,800	16,500	103,000
2	15,700	33,800	113,000	39,900	63,600	29,900	152,000	153,000	141,000	51,300	16,100	87,200
3	15,300	28,600	109,000	42,000	66,100	29,300	158,000	134,000	139,000	45,500	15,700	76,900
4	14,900	25,600	93,200	42,700	87,200	28,000	163,000	118,000	110,000	39,900	15,700	55,000
5	14,500	21,700	71,900	43,400	119,000	26,800	167,000	101,000	95,800	37,200	15,700	68,500
6	13,700	20,200	55,000	44,100	137,000	26,800	168,000	84,600	82,000	34,400	15,700	66,100
7	13,700	18,700	45,500	42,700	141,000	29,300	173,000	71,900	71,000	34,400	15,700	64,400
8	19,200	17,800	39,900	41,300	137,000	28,600	177,000	61,200	62,000	35,100	17,000	63,600
9	19,700	17,800	40,600	38,500	128,000	28,000	180,000	52,800	54,300	33,800	18,700	58,100
10	19,200	19,200	47,000	37,200	118,000	37,200	181,000	48,400	52,800	32,500	17,800	51,300
11	18,700	21,200	54,300	39,900	109,000	66,900	175,000	44,100	54,300	30,600	16,500	44,800
12	17,400	21,700	54,300	63,600	102,000	113,000	150,000	42,000	56,500	29,300	40,600	39,200
13	20,700	21,700	53,500	108,000	92,400	141,000	129,000	41,300	55,000	29,900	55,800	35,800
14	30,600	21,200	47,700	153,000	78,600	149,000	104,000	38,500	55,000	31,800	54,300	34,400
15	40,600	19,200	41,300	173,000	74,400	143,000	86,300	37,800	55,800	33,800	50,600	39,900
16	36,500	18,700	37,200	183,000	68,500	129,000	76,900	37,200	51,300	31,800	46,200	45,500
17	31,800	17,000	33,100	189,000	63,600	118,000	73,500	35,800	46,200	28,600	56,500	57,300
18	26,800	16,500	30,600	193,000	61,200	87,200	76,000	35,800	42,000	26,200	113,000	73,500
19	23,900	16,100	28,000	194,000	57,300	70,200	88,900	35,100	40,600	24,500	153,000	84,600
20	20,200	15,700	25,600	189,000	52,800	67,700	105,000	33,800	45,500	21,200	181,000	93,200
21	17,400	48,400	25,600	170,000	48,400	52,100	139,000	33,800	52,800	21,700	202,000	88,900
22	16,100	65,200	25,600	133,000	44,800	47,000	168,000	37,800	56,500	22,200	212,000	85,500
23	16,500	58,800	28,000	95,800	39,900	47,000	183,000	38,500	56,500	22,800	218,000	78,600
24	17,400	50,600	32,500	76,000	38,500	45,500	191,000	70,200	53,500	22,800	223,000	70,200
25	18,700	52,800	36,500	78,600	37,200	44,100	194,000	104,000	50,600	21,700	225,000	60,400
26	19,200	60,400	39,200	84,600	34,400	42,700	198,000	128,000	50,600	21,200	226,000	51,300
27	19,200	58,800	39,900	89,800	33,100	42,700	200,000	146,000	55,800	20,700	222,000	44,800
28	21,200	66,900	43,400	83,800	31,800	47,700	199,000	158,000	53,500	19,700	212,000	38,500
29	23,300	70,200	46,200	78,600	.....	62,000	195,000	170,000	50,600	19,200	194,000	35,100
30	28,000	100,000	45,500	73,500	.....	91,500	186,000	178,000	54,300	18,700	163,000	33,100
31	39,900	.....	42,700	69,400	.....	118,000	.....	182,000	.....	17,400	129,000	.....
1902.												
1	34,400	16,500	15,700	166,000	199,000	113,000	293,000	50,600	34,400	25,600	15,300	10,800
2	35,100	16,500	15,700	181,000	215,000	142,000	298,000	47,000	31,800	25,600	15,700	11,800
3	33,100	16,100	16,100	191,000	224,000	164,000	298,000	46,200	27,400	22,200	17,400	12,900
4	31,200	16,100	16,100	199,000	225,000	176,000	289,000	46,200	26,200	26,200	19,700	11,100
5	29,300	16,100	15,700	206,000	221,000	188,000	276,000	55,000	25,600	46,200	19,200	14,500
6	28,600	16,100	15,700	213,000	219,000	199,000	267,000	65,200	23,900	52,800	17,000	14,500
7	28,600	16,100	15,700	221,000	216,000	210,000	260,000	66,900	21,200	47,000	14,900	14,100
8	28,000	15,700	15,300	228,000	213,000	222,000	249,000	60,400	21,200	42,700	14,100	13,300
9	26,800	15,300	15,700	234,000	204,000	232,000	230,000	52,100	20,700	37,800	13,700	12,200
10	26,800	15,300	17,400	234,000	185,000	240,000	200,000	46,200	20,700	32,500	14,100	11,500
11	26,200	15,300	18,700	221,000	150,000	246,000	166,000	41,300	20,200	27,400	14,500	11,200
12	25,600	15,300	19,700	181,000	115,000	251,000	135,000	38,500	19,200	24,500	14,500	10,800
13	24,500	15,700	20,700	126,000	89,800	255,000	113,000	37,200	18,700	22,200	14,500	10,800
14	24,500	15,700	31,800	85,500	71,900	255,000	97,500	36,500	18,700	20,700	13,300	10,800
15	23,300	15,700	49,100	61,400	63,600	248,000	83,800	32,500	18,700	19,700	12,900	10,500
16	23,300	15,700	70,200	54,300	60,400	231,000	75,200	32,500	18,300	18,700	13,300	10,500
17	23,300	15,700	114,000	48,400	59,600	205,000	70,200	31,800	17,800	17,800	14,100	10,500
18	23,300	15,300	145,000	40,600	57,300	176,000	64,400	30,600	17,800	19,200	14,100	10,800
19	23,300	15,300	163,000	42,000	54,300	155,000	61,200	30,600	17,800	22,200	13,700	11,500
20	23,900	15,300	173,000	44,100	52,800	144,000	59,600	28,600	17,400	24,500	12,900	11,800
21	23,900	15,300	179,000	44,800	50,600	139,000	55,800	28,600	17,400	21,200	12,600	12,200
22	23,900	15,300	183,000	50,600	47,000	136,000	53,500	28,000	17,400	21,200	11,800	11,800
23	22,200	15,300	179,000	58,100	53,500	132,000	50,600	27,400	17,800	18,700	11,500	11,500
24	21,700	15,300	154,000	66,900	55,800	124,000	49,100	26,200	20,200	17,800	11,200	11,200
25	20,200	15,300	113,000	68,500	61,200	111,000	47,000	25,600	22,800	16,500	11,200	11,200
26	19,700	15,300	80,300	70,200	69,400	95,800	45,500	25,600	22,800	16,100	10,800	11,800
27	18,700	14,900	66,100	89,800	81,200	87,200	42,700	25,600	21,700	14,900	10,800	13,300
28	17,800	14,900	62,000	107,000	95,800	87,200	40,600	25,600	21,200	14,500	11,200	14,100
29	17,400	14,900	76,900	128,000	.....	194,000	40,600	25,600	20,200	14,500	11,200	15,300
30	17,400	14,900	104,000	146,000	.....	251,000	55,000	25,000	22,800	14,100	11,200	16,500
31	16,500	.....	140,000	174,000	.....	283,000	.....	24,500	.....	14,500	10,800	.....

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Daily discharge, in second feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1890–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1903.												
1	21,700	11,200	42,700	57,300	52,800	.....	177,000	75,200	35,800	28,000	18,300	14,100
2	23,900	11,200	47,700	54,300	49,900	.....	171,000	69,400	54,300	28,600	18,300	13,700
3	23,900	10,800	55,000	62,000	47,000	.....	165,000	64,900	73,500	28,600	16,500	12,900
4	22,800	10,500	58,800	70,200	68,500	.....	158,000	65,200	82,900	28,600	16,500	12,600
5	21,200	10,500	66,900	82,900	109,000	.....	152,000	62,000	103,000	26,800	16,100	12,600
6	20,700	10,500	76,000	81,200	141,000	.....	144,000	57,300	132,000	26,800	16,500	12,600
7	20,200	10,500	85,500	74,400	162,000	.....	131,000	52,800	146,000	25,600	18,300	12,600
8	19,700	11,200	86,300	71,000	171,000	.....	127,000	49,900	133,000	24,500	19,700	12,200
9	18,700	11,200	77,800	67,700	183,000	.....	118,000	47,000	119,000	23,900	23,900	11,800
10	17,400	11,200	68,500	66,100	195,000	.....	124,000	44,800	106,000	23,900	25,600	11,500
11	16,500	10,800	60,400	66,100	204,000	.....	141,000	43,400	98,400	24,500	26,800	11,200
12	15,700	10,800	53,500	65,200	210,000	.....	158,000	41,300	96,700	25,000	26,200	11,200
13	15,300	10,800	49,100	74,400	214,000	.....	169,000	39,900	89,800	25,000	25,000	10,800
14	15,700	10,800	45,500	78,600	219,000	.....	183,000	39,200	82,900	30,600	23,900	10,800
15	17,400	12,200	54,300	76,000	221,000	.....	186,000	42,700	76,000	33,100	23,300	10,500
16	18,700	12,600	131,000	76,900	230,000	.....	208,000	60,400	66,100	31,200	21,700	10,500
17	19,700	12,600	154,000	69,400	233,000	.....	216,000	73,500	58,800	30,600	21,200	10,500
18	18,700	12,200	.....	66,100	233,000	.....	220,000	68,500	52,100	32,500	21,200	10,200
19	17,800	11,800	.....	59,600	237,000	.....	219,000	58,100	45,500	33,800	21,700	10,200
20	17,400	11,800	.....	54,300	240,000	.....	216,000	49,900	40,600	33,100	23,300	10,200
21	18,300	11,500	.....	49,900	240,000	.....	211,000	47,700	36,500	32,500	24,500	10,200
22	18,300	11,500	.....	46,200	240,000	.....	203,000	44,800	32,500	31,200	24,500	10,200
23	17,400	11,200	.....	43,400	240,000	.....	189,000	40,600	31,200	29,900	22,800	10,200
24	16,500	11,500	.....	39,900	240,000	.....	171,000	37,200	31,200	26,200	21,700	10,200
25	15,700	12,600	.....	38,500	239,000	.....	152,000	33,800	29,900	25,000	20,700	10,200
26	14,500	17,800	.....	36,500	236,000	.....	135,000	31,200	29,900	23,900	19,700	10,200
27	14,100	29,300	.....	35,100	222,000	.....	121,000	28,600	29,900	22,200	18,700	10,200
28	12,900	36,500	.....	36,500	203,000	.....	107,000	28,000	31,200	21,200	17,800	10,200
29	12,600	36,500	.....	44,100	.....	.....	94,900	26,800	30,600	20,200	17,000	10,200
30	12,200	38,500	.....	53,500	.....	.....	83,800	27,400	29,300	19,200	15,700	10,200
31	11,500	.....	62,000	55,000	.....	.....	.....	31,800	.....	18,300	15,300	.....
1904.												
1	10,200	9,370	14,900	22,800	43,400	49,100	.....	30,600	25,600	18,700	14,900	15,700
2	10,200	9,370	13,700	23,300	37,800	47,000	.....	29,900	26,200	17,800	14,900	15,700
3	9,940	9,940	12,900	23,900	33,100	49,100	.....	28,000	29,900	17,400	14,900	15,300
4	9,940	10,500	12,200	24,500	29,300	55,800	.....	31,800	36,500	17,400	15,300	14,900
5	9,650	10,800	11,800	23,300	27,400	56,500	.....	36,500	39,900	20,200	16,500	14,500
6	9,370	11,800	11,500	22,200	25,500	52,800	.....	42,700	40,600	21,200	16,100	13,300
7	9,370	12,600	11,200	19,700	23,900	51,300	.....	43,400	38,500	22,200	15,700	13,300
8	9,370	13,700	10,800	18,700	22,800	49,900	.....	39,900	35,100	23,300	16,100	12,900
9	9,940	13,700	10,800	17,400	22,200	53,500	.....	39,200	33,800	25,600	16,500	12,600
10	9,370	14,100	10,500	16,500	23,300	61,200	.....	38,500	34,400	26,800	17,400	11,800
11	9,940	13,300	10,500	16,100	23,900	66,100	.....	37,800	32,500	26,200	18,700	11,800
12	10,500	12,900	10,500	15,700	25,000	76,000	.....	37,800	28,600	23,900	20,700	11,500
13	10,500	12,200	10,500	15,300	31,200	85,500	.....	37,800	25,600	21,700	22,200	12,600
14	10,500	12,200	10,500	14,900	35,100	94,100	.....	39,900	22,800	19,700	24,500	12,900
15	10,200	11,800	10,500	14,900	36,500	97,500	.....	42,700	21,700	19,700	25,600	12,600
16	10,200	11,500	10,500	14,500	35,100	100,000	55,000	43,400	20,700	19,700	25,000	11,800
17	10,200	11,500	10,500	15,300	33,100	99,300	49,900	40,600	19,700	19,700	23,300	11,500
18	10,800	11,800	10,500	16,100	29,900	97,500	44,800	38,500	18,700	19,700	23,300	10,800
19	11,200	13,700	10,500	17,400	28,000	92,400	40,600	34,400	17,400	20,200	22,800	10,500
20	11,200	17,800	12,200	18,300	26,800	82,900	37,200	32,500	17,000	20,200	21,200	10,200
21	10,800	19,700	17,800	18,700	25,000	71,900	35,100	30,600	17,000	18,700	20,700	10,200
22	10,500	17,800	28,600	23,300	24,500	66,100	34,400	28,600	17,400	18,300	21,200	9,940
23	10,200	22,800	36,500	42,000	26,200	80,300	34,400	26,200	17,000	17,400	20,700	9,650
24	9,940	28,600	29,300	54,300	26,200	113,000	33,800	25,000	16,100	17,400	19,200	9,940
25	9,940	28,600	26,800	61,200	26,800	137,000	33,100	23,900	15,300	16,500	18,300	10,200
26	9,650	25,000	29,300	64,400	31,800	163,000	39,900	23,300	15,300	15,700	17,000	9,940
27	9,370	22,200	31,800	76,000	39,900	194,000	39,900	22,200	15,300	14,900	15,700	9,370
28	9,370	19,700	31,200	77,800	47,000	216,000	37,200	22,800	15,700	14,100	15,300	9,370
29	9,650	17,400	28,600	69,400	49,900	228,000	35,100	21,200	17,400	14,100	15,300	9,370
30	9,650	20,700	25,600	59,600	.....	230,000	32,500	20,700	18,700	14,100	14,900	9,370
31	9,370	.....	23,900	50,600	.....	227,000	.....	25,000	.....	14,900	15,700	.....

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Daily discharge, in second feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1890–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1905.												
1	9,090	7,150	9,090	86,300	34,400	168,000	45,500	44,800	61,200	70,200	28,600	32,500
2	9,090	7,150	9,370	84,600	35,100	147,000	42,700	52,100	52,100	74,400	27,400	31,200
3	8,820	7,150	9,650	72,700	31,800	118,000	39,900	57,300	45,500	78,600	25,000	32,500
4	8,560	7,150	9,940	60,400	29,900	94,100	38,500	62,000	39,900	84,600	23,300	31,200
5	8,560	7,380	10,500	49,900	28,000	78,800	38,500	62,800	39,900	76,900	21,700	29,300
6	8,300	7,580	10,800	41,300	30,600	67,700	37,800	60,400	37,200	62,800	21,200	35,800
7	8,300	7,810	12,600	37,200	40,600	60,400	37,200	61,200	33,800	50,600	21,200	31,200
8	8,300	8,050	14,900	34,400	58,100	55,000	35,800	61,200	31,200	41,300	21,700	27,400
9	8,300	8,050	20,200	32,500	85,500	62,000	35,100	59,600	28,600	36,500	21,200	23,900
10	8,560	8,050	23,900	32,500	129,000	106,000	33,100	55,800	26,800	34,400	20,700	21,200
11	8,560	8,050	27,400	32,500	164,000	141,000	33,100	52,800	25,000	35,800	19,700	22,800
12	8,560	8,050	29,900	38,500	182,000	165,000	35,800	49,100	23,900	35,100	18,700	22,200
13	8,300	8,050	31,800	80,300	190,000	168,000	39,200	52,800	23,300	38,500	21,700	22,200
14	8,050	8,050	30,600	109,900	194,000	164,000	41,300	58,800	21,700	42,700	23,900	22,200
15	8,050	8,050	26,800	118,000	194,000	163,000	42,700	60,400	21,200	43,400	28,000	21,200
16	8,050	8,050	24,500	117,000	192,000	158,000	44,100	57,300	20,700	43,400	36,500	19,700
17	7,810	8,300	20,700	124,000	183,000	147,000	45,500	52,100	20,700	50,600	46,200	18,700
18	7,810	8,560	18,700	129,000	165,000	128,000	47,700	47,000	21,200	66,900	54,300	17,400
19	7,580	8,560	17,400	128,000	141,000	105,000	49,100	45,500	22,800	73,500	57,300	16,500
20	7,580	8,560	16,100	113,000	124,000	88,900	47,700	58,800	23,300	70,200	55,000	16,500
21	7,580	8,560	15,700	94,100	115,000	76,000	44,800	82,000	23,900	60,400	51,300	16,500
22	7,360	8,800	14,900	74,400	127,000	68,500	42,000	94,100	23,300	48,400	47,000	16,100
23	7,360	8,560	14,500	61,200	164,000	70,200	37,800	109,000	28,000	41,300	42,000	16,100
24	7,360	8,820	14,900	52,100	181,000	74,400	36,500	132,000	33,800	33,800	37,200	15,700
25	7,360	9,090	15,700	44,800	189,000	76,000	34,400	139,000	55,000	32,500	35,800	15,300
26	7,150	9,370	16,100	40,600	193,000	74,400	33,100	153,000	57,300	31,200	32,500	14,500
27	7,150	9,370	26,800	34,400	193,000	70,200	33,100	158,000	51,300	29,900	29,900	14,100
28	7,150	9,370	62,000	33,100	187,000	64,400	33,100	150,000	50,600	29,900	28,000	13,300
29	7,150	9,370	80,300	31,800	.....	58,100	34,400	119,000	58,100	29,300	32,500	12,600
30	7,150	9,370	88,100	29,900	.....	52,800	39,200	95,800	62,000	28,000	36,500	12,600
31	7,150	.....	84,600	33,100	.....	49,100	.....	75,200	.....	28,000	35,100	.....
1906.												
1	11,800	22,800	16,500	76,900	137,000	47,000	.....	45,500	25,000	39,200	64,400	44,100
2	11,800	23,300	15,700	69,400	113,000	44,800	.....	44,100	29,900	37,800	58,100	42,000
3	11,800	23,300	16,500	62,000	95,800	43,400	.....	42,000	29,300	35,100	54,300	47,000
4	11,500	23,300	19,700	64,400	85,500	47,000	.....	39,900	31,200	31,800	52,100	62,000
5	11,500	20,200	19,700	68,500	76,000	62,800	.....	38,500	31,800	29,300	54,300	72,700
6	11,500	19,200	22,200	72,700	72,700	78,800	.....	37,200	31,800	27,400	59,600	71,900
7	12,200	18,300	23,300	90,600	67,700	82,900	.....	38,500	31,200	26,800	60,400	66,100
8	12,200	17,400	39,200	103,000	66,900	88,100	.....	37,800	31,200	25,600	56,500	58,800
9	12,200	16,500	58,800	104,000	57,300	87,200	.....	38,500	31,800	23,900	53,500	54,300
10	11,800	15,700	63,600	114,000	48,400	78,600	.....	39,900	30,600	22,800	51,300	54,300
11	11,800	14,900	64,400	109,000	47,700	69,400	.....	39,900	29,300	22,800	49,900	58,800
12	12,900	14,500	62,800	100,000	46,200	66,100	.....	44,100	27,400	23,900	48,400	65,200
13	16,500	14,500	66,900	89,800	43,400	58,100	.....	50,600	26,200	23,300	44,800	66,900
14	20,700	14,100	71,000	89,800	40,600	54,300	.....	53,500	25,000	35,800	42,700	69,400
15	20,200	14,100	67,700	88,900	39,200	59,600	.....	52,100	23,900	54,300	40,600	69,400
16	19,700	13,700	81,200	82,900	37,800	73,500	.....	47,000	23,300	46,200	40,600	62,800
17	19,700	14,100	89,800	77,800	35,800	101,000	77,800	42,000	22,200	46,200	39,900	55,000
18	22,200	14,500	94,900	73,500	34,400	112,000	70,200	37,200	23,900	62,000	38,500	47,700
19	23,900	14,100	85,500	70,200	33,100	113,000	69,400	33,100	31,200	87,200	38,500	41,300
20	27,400	13,700	82,900	71,900	32,500	111,000	69,400	31,800	39,900	98,400	42,700	37,200
21	27,400	13,300	74,400	76,000	31,800	116,000	71,000	29,300	50,600	101,000	45,500	34,400
22	26,200	13,300	70,200	80,300	31,200	126,000	72,700	28,000	50,600	109,000	48,400	37,200
23	24,500	12,900	76,900	87,200	31,800	126,000	71,000	26,800	46,200	115,000	48,400	40,600
24	22,800	12,900	95,800	126,000	32,500	121,000	65,200	25,000	41,300	111,000	49,900	49,900
25	25,000	12,900	113,000	158,000	37,200	120,000	57,300	23,900	35,800	103,000	48,400	71,000
26	18,700	12,900	121,000	177,000	37,800	116,000	51,300	22,800	33,100	98,400	47,000	79,500
27	18,300	12,900	118,000	176,000	41,300	91,500	46,200	22,800	29,900	100,000	44,100	79,500
28	18,700	12,900	111,000	167,000	45,500	89,800	44,100	25,000	29,900	97,500	43,400	74,400
29	22,200	12,900	108,000	166,000	.....	93,200	44,800	26,800	32,500	88,900	42,700	71,000
30	23,300	17,400	98,400	166,000	.....	111,000	46,200	29,900	36,500	78,600	43,400	86,300
31	22,800	.....	87,200	158,000	.....	131,000	.....	31,200	.....	70,200	46,200	.....

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Daily discharge, in second feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1890–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1907.												
1	114,000	39,200	116,000	110,000	.....	70,200	57,300	106,000	43,400	41,300	22,800	23,300
2	121,000	36,500	84,600	141,000	.....	118,000	50,600	128,000	51,300	42,700	21,700	22,800
3	113,000	34,400	64,400	169,000	.....	172,000	45,500	124,000	58,100	41,300	21,200	22,200
4	135,000	32,500	55,800	.....	.....	197,000	40,600	107,000	59,600	42,000	21,700	20,700
5	165,000	28,600	49,900	.....	.....	206,000	40,600	91,500	55,000	44,100	26,800	19,200
6	183,000	28,600	47,700	.....	.....	204,000	47,000	84,600	52,800	42,700	29,900	18,700
7	194,000	28,000	45,500	.....	.....	199,000	53,500	135,000	51,300	39,200	29,300	19,200
8	204,000	27,400	43,400	.....	.....	.....	54,300	153,000	52,100	39,200	27,400	19,700
9	205,000	26,800	42,000	.....	.....	.....	55,000	173,000	56,500	32,500	23,900	18,700
10	195,000	26,200	40,600	.....	109,000	.....	57,300	173,000	60,400	29,900	22,200	18,700
11	181,000	25,600	39,900	.....	98,400	.....	71,000	163,000	62,000	28,600	21,200	19,200
12	162,000	25,000	41,300	.....	90,600	.....	77,800	158,000	61,200	26,800	22,200	19,200
13	139,000	23,900	41,300	.....	78,600	.....	76,900	161,000	62,000	26,200	23,900	19,200
14	113,000	22,800	42,000	.....	73,500	.....	74,400	162,000	74,400	25,600	22,800	19,700
15	88,100	24,500	41,300	.....	66,100	.....	71,900	167,000	84,600	29,300	22,200	23,300
16	71,900	24,500	42,700	.....	60,400	.....	68,500	176,000	87,200	32,500	21,700	25,000
17	62,800	24,500	62,000	.....	55,800	.....	64,400	173,000	82,900	32,500	23,900	28,600
18	55,800	129,000	82,000	.....	49,900	.....	58,800	162,000	78,600	35,800	26,800	28,600
19	52,800	154,000	62,000	.....	48,400	.....	54,300	144,000	76,000	42,700	26,200	26,200
20	51,300	176,000	105,000	.....	47,000	.....	52,100	122,000	82,900	43,400	25,000	23,900
21	51,300	179,000	97,500	.....	45,500	.....	49,100	100,000	93,200	41,300	23,900	22,200
22	53,500	171,000	89,800	.....	44,100	.....	49,100	78,600	88,100	38,500	22,800	21,200
23	55,800	175,000	89,800	.....	39,900	.....	49,100	69,400	71,900	36,500	22,800	20,200
24	55,000	183,000	89,800	.....	39,900	.....	52,100	58,800	55,800	33,800	22,200	21,200
25	53,500	190,000	87,200	.....	46,200	.....	55,000	52,800	47,700	32,500	21,300	27,400
26	53,500	197,000	78,600	.....	51,300	.....	55,800	48,400	44,100	29,900	22,200	30,600
27	57,300	200,000	76,900	.....	54,300	.....	58,800	47,000	42,700	28,000	23,300	35,100
28	55,800	201,000	67,700	.....	57,300	.....	60,400	46,200	42,700	27,400	23,900	51,300
29	52,100	193,000	67,700	.....	.....	.....	66,900	43,400	42,000	26,200	24,500	62,800
30	46,200	158,000	61,200	.....	.....	.....	72,700	40,600	42,700	25,000	23,900	64,400
31	42,000	.....	91,500	.....	.....	.....	.....	39,200	.....	22,800	22,800	.....
1908.												
1	58,800	14,100	91,500	85,500	51,300	.....	.....	111,000	47,000	25,600	19,700	36,500
2	51,300	14,500	82,900	104,000	61,200	.....	.....	114,000	47,700	28,000	19,700	38,500
3	40,600	15,300	68,500	118,000	74,400	.....	.....	105,000	47,000	28,600	19,200	37,800
4	36,500	16,500	56,500	132,000	82,000	.....	.....	92,400	47,000	29,300	19,200	33,100
5	33,100	17,000	47,700	150,000	83,800	.....	.....	79,500	54,300	28,600	18,700	28,600
6	32,500	17,400	41,300	161,000	94,100	.....	.....	82,000	61,200	26,200	21,200	28,000
7	29,900	18,700	37,200	167,000	94,900	.....	.....	104,000	62,000	26,200	22,200	31,200
8	27,400	17,400	32,500	159,000	94,900	.....	.....	127,000	54,300	25,600	23,900	33,800
9	26,800	17,800	32,500	149,000	89,800	.....	.....	121,000	49,900	28,600	23,900	30,600
10	25,000	20,700	33,800	141,000	85,500	.....	.....	.....	53,500	36,500	23,300	27,400
11	22,800	23,300	31,800	133,000	102,000	.....	.....	.....	55,000	42,700	23,300	24,500
12	23,300	25,600	30,600	122,000	126,000	.....	.....	.....	53,500	44,100	25,000	23,300
13	23,300	26,800	31,800	110,000	155,000	.....	.....	.....	49,900	44,100	27,400	24,500
14	22,800	27,400	32,500	102,000	170,000	.....	.....	.....	47,000	44,800	29,900	26,200
15	21,700	29,900	33,800	99,300	.....	.....	.....	.....	42,700	44,800	31,200	26,800
16	21,200	38,500	35,800	104,000	.....	.....	.....	.....	39,900	44,100	31,200	25,600
17	20,200	50,600	45,500	119,000	.....	.....	.....	.....	37,800	46,200	28,000	22,200
18	19,700	58,100	49,100	137,000	.....	.....	.....	.....	35,100	34,400	25,600	20,200
19	18,700	54,300	52,800	149,000	.....	.....	.....	.....	33,100	29,900	23,900	18,700
20	17,800	45,500	53,500	147,000	.....	.....	.....	.....	31,200	28,000	22,800	17,400
21	17,400	39,900	52,800	134,000	.....	.....	.....	.....	29,900	26,800	22,200	16,100
22	17,000	37,800	51,300	108,000	.....	.....	.....	.....	29,900	26,200	21,200	15,700
23	16,500	39,900	50,600	100,000	.....	.....	.....	.....	31,200	26,200	20,200	15,300
24	16,500	39,900	55,800	86,300	.....	.....	87,200	52,800	31,200	25,000	19,700	18,700
25	16,100	46,200	56,500	77,800	.....	.....	82,900	47,700	29,300	24,500	21,200	18,700
26	15,700	55,800	58,100	69,400	.....	.....	100,000	47,700	28,000	23,900	24,500	17,400
27	15,300	66,900	58,100	62,800	.....	.....	112,000	47,000	26,800	23,300	29,300	17,000
28	14,900	81,200	58,100	58,100	.....	.....	107,000	49,900	26,200	23,300	37,800	16,100
29	14,500	91,500	58,800	55,000	.....	.....	95,800	52,100	25,000	22,200	39,900	15,300
30	14,500	95,800	60,400	52,100	.....	.....	104,000	51,300	25,000	21,200	37,800	14,900
31	14,500	.....	70,200	49,100	.....	.....	.....	48,400	.....	20,200	35,100	.....

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Daily discharge, in second feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1890–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1909.												
1	14,500	22,200	20,700	67,700	44,100	274,000	129,000	94,900	98,400	98,400	37,200	22,200
2	14,100	25,600	19,200	62,000	44,100	266,000	132,000	105,000	113,000	95,800	35,800	21,200
3	13,700	22,800	19,200	62,000	41,300	260,000	135,000	120,000	119,000	88,100	35,100	20,200
4	12,900	17,400	18,300	62,000	41,300	250,000	134,000	155,000	107,000	78,600	33,900	18,700
5	12,600	22,800	17,000	61,200	39,900	234,000	126,000	167,000	101,000	73,500	39,900	19,700
6	12,200	31,200	16,500	59,600	42,000	210,000	110,000	174,000	116,000	68,500	47,700	19,700
7	12,200	31,200	18,300	59,600	47,000	182,000	107,000	178,000	151,000	66,100	54,300	20,700
8	12,200	28,000	24,500	62,800	48,400	158,000	96,700	180,000	168,000	62,800	58,800	21,200
9	12,200	25,000	42,700	67,700	52,800	142,000	98,400	173,000	177,000	59,600	61,200	21,200
10	12,200	23,300	65,200	72,700	60,400	147,000	101,000	155,000	184,000	56,500	59,600	20,200
11	12,200	21,700	82,000	75,200	75,200	157,000	96,700	126,000	185,000	59,600	52,800	21,200
12	12,600	20,700	94,100	74,400	103,000	160,000	89,800	102,000	180,000	82,900	45,500	21,700
13	12,600	20,200	98,400	70,200	125,000	174,000	90,600	87,200	168,000	111,000	40,600	23,900
14	12,600	19,200	93,200	64,400	142,000	190,000	104,000	79,500	159,000	126,000	37,200	23,300
15	12,600	17,800	81,200	60,400	176,000	205,000	113,000	76,000	134,000	126,000	33,800	21,700
16	12,200	17,000	69,400	65,200	200,000	221,000	111,000	82,000	118,000	113,000	31,800	21,200
17	13,300	17,400	59,600	79,500	215,000	231,000	99,300	82,000	104,000	95,800	31,200	20,700
18	15,300	17,000	55,800	91,500	222,000	239,000	88,900	76,900	96,700	94,100	29,900	20,200
19	17,400	17,800	52,100	108,000	218,000	243,000	80,300	68,500	94,100	95,800	29,900	21,700
20	17,400	19,200	49,900	122,000	212,000	247,000	71,900	68,500	91,500	94,900	30,600	20,700
21	17,000	20,200	46,200	128,000	205,000	248,000	71,900	65,200	88,100	87,200	33,100	19,700
22	16,100	20,700	42,000	133,000	201,000	239,000	66,100	59,600	82,900	76,000	58,800	19,200
23	15,300	20,700	40,600	133,000	197,000	220,000	62,800	62,000	84,600	61,200	66,900	17,800
24	13,700	20,200	43,400	125,000	214,000	187,000	58,800	71,000	100,000	52,800	58,800	17,800
25	13,300	19,200	61,200	107,000	238,000	156,000	58,100	85,500	108,000	46,200	47,700	19,700
26	12,600	18,300	71,900	88,900	259,000	131,000	67,700	113,000	104,000	42,700	38,500	20,700
27	12,200	19,200	82,900	73,500	270,000	122,000	78,600	137,000	95,800	39,900	32,500	21,200
28	11,800	18,700	91,500	65,200	274,000	118,000	89,800	146,000	89,800	38,500	29,900	22,200
29	11,800	19,700	91,500	54,300	.....	111,000	90,600	137,000	89,800	39,900	26,200	23,900
30	11,500	21,200	82,900	50,600	.....	117,000	90,600	113,000	95,800	39,200	25,000	28,000
31	14,100	.....	76,900	46,200	.....	125,000	.....	93,200	.....	38,500	23,300	.....
1910.												
1	28,600	17,000	15,700	31,200	59,600	103,000	25,600	35,800	107,000	48,400	38,500	20,700
2	26,800	16,500	15,700	30,600	47,700	93,200	25,600	37,200	83,800	57,300	36,500	20,200
3	23,900	16,100	15,700	30,600	46,200	94,100	25,000	40,600	69,400	63,600	35,800	20,700
4	21,700	15,700	15,700	23,300	44,100	96,700	24,500	42,000	52,100	68,500	37,200	23,900
5	20,200	15,700	15,700	23,300	43,400	111,000	23,900	40,600	50,600	75,200	41,300	26,800
6	18,700	15,700	15,700	26,800	38,500	122,000	23,300	38,500	48,400	85,500	45,500	31,200
7	17,000	15,700	15,700	39,900	37,200	126,000	22,800	35,800	46,200	96,700	42,000	47,700
8	16,500	15,300	17,400	62,000	35,800	121,000	22,200	33,100	44,800	111,000	39,200	51,300
9	16,500	15,300	19,200	85,500	35,100	111,000	22,200	31,200	48,400	116,000	37,200	47,700
10	15,700	15,300	22,200	90,600	34,400	95,800	21,200	29,300	54,300	118,000	40,600	42,700
11	15,700	15,300	25,000	99,300	33,100	87,200	21,200	28,600	71,900	118,000	42,700	39,900
12	15,300	15,300	26,200	101,000	36,500	78,600	20,700	31,800	97,500	119,000	44,800	38,500
13	14,900	15,300	30,600	96,700	34,400	71,000	20,700	40,600	100,000	118,000	42,700	35,800
14	14,900	15,300	33,100	95,800	31,800	63,600	20,200	49,900	88,100	111,000	39,900	33,100
15	16,100	15,300	33,100	85,500	33,100	58,800	22,200	53,500	78,600	102,000	38,500	31,200
16	19,200	14,900	32,500	76,000	33,100	54,300	87,200	54,300	80,300	94,900	35,100	29,900
17	25,000	14,900	32,500	68,500	35,100	52,100	94,100	51,300	79,500	86,300	31,800	29,300
18	33,100	14,900	37,200	53,500	58,800	47,700	111,000	47,700	71,900	78,600	28,600	28,600
19	34,400	14,900	37,200	55,800	111,000	46,200	99,300	44,100	66,100	84,600	26,200	26,200
20	35,100	14,900	39,900	55,000	128,000	42,000	84,600	42,000	61,200	102,000	24,500	23,900
21	37,200	14,900	40,600	58,800	148,000	39,200	76,000	51,300	59,600	103,000	23,900	22,200
22	33,100	14,900	37,800	60,400	162,000	38,500	70,200	61,200	58,100	88,900	22,800	20,700
23	28,600	14,900	33,800	66,100	168,000	37,200	69,400	79,500	56,500	75,200	21,700	20,200
24	26,800	14,900	31,200	74,400	168,000	35,800	62,000	102,000	54,300	61,200	25,000	19,200
25	23,900	15,300	28,600	82,900	161,000	35,800	55,800	111,000	51,300	53,500	23,900	18,300
26	21,700	16,500	26,200	87,200	146,000	33,100	49,100	118,000	49,100	49,100	23,900	17,400
27	20,700	17,000	26,200	89,800	128,000	31,200	44,800	125,000	46,200	46,200	24,500	17,000
28	19,200	17,000	26,800	88,100	116,000	29,900	39,900	128,000	43,400	45,500	23,300	16,500
29	18,300	16,100	31,200	82,000	.....	28,600	38,500	128,000	42,000	47,700	22,200	16,500
30	17,800	15,700	31,800	73,500	.....	27,400	36,500	124,000	41,300	49,100	21,700	16,500
31	17,000	.....	31,200	66,900	.....	26,200	.....	113,000	.....	44,100	21,200	.....

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Daily discharge, in second feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1890–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1911.												
1	16,500	13,700	14,100	37,200	52,800	56,500	66,900	83,800	28,000	25,600	30,600	15,700
2	16,500	14,100	14,900	44,800	53,500	60,400	66,900	73,500	25,600	22,800	27,400	14,900
3	16,500	13,300	14,900	70,200	52,800	59,600	63,600	65,200	24,500	21,200	28,000	14,100
4	16,500	13,300	14,900	126,000	54,300	56,500	62,800	62,000	23,300	20,700	31,800	13,700
5	16,500	12,900	15,700	167,000	61,200	54,300	114,000	66,100	22,200	21,200	33,100	13,300
6	17,800	13,300	16,500	187,000	68,500	51,300	155,000	78,600	21,700	22,200	29,300	13,700
7	19,700	13,300	19,700	194,000	75,200	47,700	191,000	85,500	21,200	21,200	29,900	14,100
8	20,700	13,300	21,200	199,000	93,200	45,500	213,000	83,800	21,200	20,700	29,300	17,000
9	21,200	13,300	45,500	202,000	129,000	42,700	230,000	75,200	21,700	19,700	31,200	20,200
10	20,200	13,300	63,600	201,000	165,000	42,000	240,000	63,600	22,200	18,300	31,800	19,700
11	19,700	13,300	74,400	194,000	188,000	40,600	248,000	55,000	21,700	17,800	30,600	19,700
12	19,200	12,900	67,700	171,000	202,000	52,800	256,000	49,100	20,700	19,200	28,000	19,700
13	18,300	12,600	65,200	131,000	205,000	91,500	262,000	44,800	20,200	19,700	25,600	20,200
14	17,800	12,600	55,800	94,900	207,000	117,000	276,000	42,700	19,700	20,200	23,900	21,700
15	17,800	12,600	52,800	71,000	209,000	126,000	290,000	39,200	19,700	20,200	22,200	20,700
16	20,700	12,200	39,200	58,800	209,000	116,000	299,000	37,800	19,700	20,700	21,200	19,700
17	23,900	12,200	32,500	57,300	205,000	96,700	302,000	35,800	19,700	22,800	20,700	17,800
18	25,000	12,200	30,600	47,000	191,000	76,900	300,000	33,800	18,300	25,000	20,200	16,500
19	22,800	12,200	25,600	43,400	161,000	61,200	295,000	32,500	17,400	25,000	21,200	16,100
20	20,700	11,800	23,900	40,600	129,000	53,500	284,000	31,200	16,500	25,000	22,200	17,000
21	18,700	11,800	22,800	38,500	105,000	49,100	274,000	30,600	16,500	25,000	22,800	17,000
22	17,000	11,800	20,700	37,200	87,200	46,200	267,000	30,600	17,000	28,600	25,000	15,700
23	16,100	11,500	19,200	35,800	77,800	43,400	262,000	33,100	17,400	39,900	23,300	14,900
24	15,700	11,500	19,700	35,800	75,200	40,600	256,000	35,100	17,400	44,100	22,200	14,500
25	14,900	11,500	21,200	34,400	65,200	39,200	247,000	43,400	17,400	40,600	20,700	14,100
26	14,100	11,500	21,700	36,500	61,200	39,900	230,000	44,100	18,300	37,200	19,700	13,700
27	13,700	11,500	22,200	39,900	58,800	41,300	200,000	41,300	22,200	38,500	22,800	13,700
28	13,700	11,800	22,800	38,500	57,300	47,000	169,000	38,500	24,500	37,200	21,200	13,300
29	13,300	13,300	22,800	38,500	.....	53,500	124,000	35,100	26,200	37,800	19,700	13,300
30	13,300	13,300	28,600	44,800	.....	58,800	95,800	32,500	25,000	37,800	19,200	12,900
31	13,300	.....	31,200	50,600	.....	64,400	.....	29,900	.....	35,100	17,400	.....
1912.												
1	12,900	19,700	31,800	244,000	115,000	.....	.....	.....	74,400	40,600	33,800	29,900
2	12,900	18,700	33,100	251,000	123,000	.....	.....	.....	76,900	49,100	33,100	25,600
3	14,100	17,400	33,800	257,000	131,000	.....	.....	.....	76,900	64,400	33,100	23,900
4	15,300	16,500	32,500	252,000	135,000	.....	.....	.....	73,500	61,200	31,200	22,200
5	15,300	16,100	29,900	239,000	133,000	.....	.....	.....	65,200	61,200	29,300	21,200
6	14,100	15,700	28,600	219,000	124,000	.....	.....	.....	60,400	52,800	28,600	20,200
7	12,900	16,500	26,800	191,000	109,000	.....	.....	.....	56,500	52,100	31,800	18,700
8	12,200	17,400	25,600	155,000	90,600	.....	.....	.....	49,900	64,400	34,400	17,800
9	12,200	17,400	25,600	122,000	74,400	.....	.....	.....	46,200	77,800	37,200	17,800
10	11,800	17,400	22,800	109,000	63,600	.....	.....	.....	43,400	88,100	36,500	17,000
11	12,600	17,400	22,200	110,000	55,800	.....	.....	.....	42,000	92,400	38,500	16,500
12	14,100	18,300	30,600	111,000	51,300	.....	.....	.....	39,200	85,500	42,700	16,100
13	15,300	20,200	84,600	102,000	47,000	.....	.....	.....	37,200	79,500	42,700	15,300
14	15,700	23,900	112,000	92,400	45,500	.....	.....	.....	35,100	79,500	38,500	14,900
15	15,700	28,600	147,000	84,600	41,300	.....	.....	.....	33,800	74,400	34,400	15,700
16	15,700	33,100	169,000	75,200	41,300	.....	.....	.....	31,800	68,500	31,800	17,000
17	17,400	35,100	179,000	66,900	42,700	.....	.....	85,500	30,600	66,100	33,100	17,400
18	22,800	37,800	176,000	61,200	47,000	.....	.....	76,000	29,300	61,200	32,500	17,400
19	25,000	39,200	160,000	66,900	49,100	.....	.....	67,700	29,900	58,100	29,900	17,400
20	28,000	37,800	135,000	71,900	51,300	.....	.....	62,000	30,600	53,500	26,800	17,400
21	31,200	35,800	113,000	78,600	85,500	.....	.....	58,100	30,600	49,900	26,800	17,400
22	33,100	34,400	94,100	80,300	126,000	.....	.....	55,800	31,200	49,100	26,800	16,500
23	35,100	33,100	82,900	70,200	139,000	.....	.....	55,000	31,800	45,500	26,800	16,500
24	37,800	35,100	99,300	62,800	150,000	.....	.....	55,000	31,200	42,700	28,600	17,800
25	39,900	36,500	114,000	58,800	151,000	.....	.....	53,500	29,900	39,900	28,600	30,600
26	41,300	35,100	118,000	56,500	164,000	.....	.....	50,600	29,300	39,200	29,300	38,500
27	36,500	33,100	178,000	55,800	182,000	.....	.....	46,200	28,600	38,500	30,600	40,600
28	31,200	31,800	214,000	54,300	199,000	.....	.....	42,700	28,300	38,500	30,600	39,200
29	26,200	31,200	230,000	55,000	211,000	.....	.....	42,700	31,800	37,200	33,100	40,600
30	22,800	31,200	233,000	69,400	.....	.....	.....	44,800	34,400	36,500	33,800	37,200
31	20,200	.....	239,000	97,500	.....	.....	.....	58,100	.....	33,100	31,800	.....

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Daily discharge, in second feet, of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1890–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1913.												
1	33,800	16,100	14,100	44,100	.....	180,000	.....	41,300	93,200	23,300	16,500	14,100
2	31,800	15,700	13,700	53,500	.....	205,000	.....	40,600	82,900	22,800	17,400	14,100
3	29,900	15,700	16,100	58,100	.....	214,000	.....	39,900	80,300	24,500	18,300	14,100
4	28,000	15,700	18,300	67,700	.....	210,000	.....	39,200	80,300	23,900	19,200	14,100
5	26,800	15,300	19,200	85,500	.....	207,000	.....	37,800	75,200	21,200	19,700	13,700
6	26,200	14,900	28,600	92,400	.....	202,000	.....	36,500	68,500	20,700	18,700	13,300
7	22,200	14,100	53,500	152,000	.....	190,000	.....	35,100	62,800	19,200	18,300	12,600
8	20,700	14,100	63,600	224,000	.....	167,000	.....	34,400	62,800	18,300	18,300	12,600
9	19,200	14,500	66,100	243,000	.....	131,000	.....	33,100	62,000	17,800	18,300	12,200
10	17,000	14,500	72,700	.....	.....	100,000	.....	33,100	68,500	19,200	17,800	12,600
11	17,400	15,700	77,800	.....	.....	85,500	.....	32,500	63,600	19,700	17,800	12,600
12	17,400	15,700	73,500	.....	.....	74,400	.....	30,600	55,800	20,700	17,800	12,600
13	16,500	15,300	65,200	.....	132,000	67,700	.....	29,300	49,900	23,300	17,800	11,800
14	15,700	15,300	54,300	.....	146,000	75,200	.....	29,300	49,900	22,800	17,000	11,500
15	15,300	14,500	49,100	.....	150,000	118,000	.....	30,600	53,500	22,200	15,300	11,200
16	14,900	19,200	44,100	.....	150,000	167,000	.....	30,600	51,300	21,700	16,100	11,500
17	14,500	20,200	34,400	.....	149,000	194,000	.....	29,300	46,200	20,700	17,000	12,600
18	14,900	20,200	31,200	.....	140,000	202,000	.....	29,900	41,300	20,200	19,700	13,300
19	14,900	19,200	29,900	.....	125,000	204,000	.....	33,100	36,500	19,700	20,200	12,600
20	15,700	18,300	27,400	.....	107,000	206,000	.....	33,800	33,100	19,700	19,200	12,200
21	16,500	18,300	26,800	.....	90,600	214,000	.....	33,100	30,600	19,700	18,700	11,800
22	17,400	17,000	25,000	.....	82,900	.....	.....	32,500	28,000	18,300	17,000	11,500
23	18,700	16,100	24,500	.....	71,000	.....	.....	34,400	26,800	17,000	16,500	11,500
24	19,700	15,300	23,300	.....	65,200	.....	64,400	38,500	26,800	16,500	16,500	11,500
25	19,200	15,300	33,800	.....	62,000	.....	59,600	45,500	26,800	16,100	16,100	11,500
26	19,200	14,900	38,500	.....	60,400	.....	55,000	56,500	26,200	16,500	15,700	11,800
27	19,200	14,500	41,300	.....	82,900	.....	51,300	64,400	25,600	16,500	15,700	11,800
28	18,700	14,500	38,500	.....	126,000	.....	47,000	76,900	25,000	15,700	15,300	13,700
29	17,800	14,500	37,800	.....	.....	.....	44,100	95,800	24,500	15,700	15,300	15,300
30	17,000	14,100	38,500	.....	.....	.....	42,700	104,000	23,900	15,300	14,900	16,500
31	16,500	.....	41,300	.....	.....	.....	.....	103,000	.....	15,300	14,500	.....

Monthly discharge of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1890–1913.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1890.					
October	47,000	15,700	22,700	0.590	0.68
November	141,000	18,300	74,300	1.93	2.15
December	95,800	25,600	43,000	1.12	1.29
January [a]	.....	26,200	78,200	2.03	2.34
February [a]	.....	.....	140,000	3.64	3.79
March [a]	.....	.....	230,000	5.97	6.88
April [a]	.....	.....	123,000	3.19	3.56
May	105,000	55,800	76,000	1.97	2.27
June	66,900	24,500	37,900	.984	1.10
July	44,800	18,300	24,600	.639	.74
August	46,200	17,800	32,900	.855	.99
September	59,600	23,300	33,500	.870	.97
The year	.....	15,700	75,900	1.97	26.76
1891.					
October	62,000	25,000	39,500	1.03	1.19
November	58,160	21,200	30,900	.803	.90
December	78,600	19,200	33,900	.881	1.02
January	158,000	75,200	107,000	2.78	3.20
February [a]	302,000	166,000	260,000	6.75	7.03
March [a]	.....	.....	230,000	5.97	6.88
April [a]	.....	71,000	119,000	3.09	3.45
May	60,400	27,400	37,300	.969	1.12
June	56,500	25,000	39,500	1.03	1.15
July	42,000	20,200	26,300	.683	.79
August	113,000	22,800	47,900	1.24	1.43
September	46,200	15,700	26,000	.675	.75
The year	.....	15,700	82,000	2.13	28.91

[a] Period of probable backwater extends over part or whole of month. See "Backwater" in station description.

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Monthly discharge of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1890–1913—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1892.					
October	14,900	12,600	13,800	0.358	0.41
November	39,900	12,600	20,400	.530	.59
December	94,100	30,600	55,400	1.44	1.66
January	239,000	74,400	143,000	3.71	4.28
February	115,000	49,160	91,000	2.36	2.54
March	123,000	46,200	76,400	1.98	2.28
April [a]	.....	96,700	221,000	5.74	6.40
May [a]	.....	44,100	69,900	1.82	2.10
June [a]	79,500	34,400	56,200	1.46	1.63
July	176,000	33,100	79,400	2.06	2.38
August	37,200	23,300	28,700	.745	.86
September	36,500	19,200	26,000	.675	.75
The year	.....	12,600	73,300	1.90	25.88
1893.					
October	23,300	12,900	15,800	.410	.47
November	40,600	12,900	26,600	.691	.77
December	135,000	32,500	73,800	1.92	2.21
January	96,700	21,700	40,700	1.06	1.22
February [a]	280,000	33,800	154,000	4.00	4.16
March [a]	268,000	58,100	107,000	2.78	3.20
April [a]	247,000	42,000	118,000	3.06	3.41
May [a]	221,000	49,900	127,000	3.30	3.80
June	212,000	37,200	118,000	3.06	3.41
July	37,200	18,700	24,300	.631	.73
August	25,600	14,100	19,700	.512	.59
September	63,600	13,300	31,100	.808	.90
The year	280,000	12,900	70,600	1.83	24.87
1894.					
October	37,800	14,900	20,000	.519	.60
November	25,600	14,900	18,300	.475	.53
December	35,100	17,400	25,500	.662	.76
January	99,300	19,200	60,600	1.57	1.81
February [a]	258,000	42,700	164,000	4.26	4.44
March	136,000	62,800	90,400	2.35	2.71
April	110,000	32,500	70,700	1.84	2.05
May	40,600	27,400	32,100	.834	.96
June	31,800	15,700	19,300	.501	.56
July	28,600	16,500	21,200	.551	.64
August	29,300	14,100	19,700	.512	.59
September	20,200	12,600	15,700	.408	.46
The year	258,000	12,600	45,600	1.18	16.11
1895.					
October	12,600	9,940	10,800	.281	.32
November	11,800	9,650	10,700	.278	.31
December	63,600	10,800	24,400	.634	.73
January	207,000	26,200	112,000	2.91	3.36
February	88,900	34,400	55,100	1.43	1.49
March	200,000	51,300	133,000	3.45	3.98
April	107,000	56,500	75,700	1.97	2.20
May	64,400	39,900	51,300	1.33	1.53
June	55,800	19,200	28,600	.743	.83
July	50,600	18,300	31,500	.818	.94
August	51,300	18,300	26,800	.696	.80
September	23,900	11,800	17,800	.462	.52
The year	207,000	9,650	48,300	1.25	17.01
1896.					
October	11,200	9,370	9,820	.255	.29
November	13,700	9,370	11,600	.301	.34
December	86,300	11,800	20,700	.538	.62
January	54,300	21,700	34,100	.886	1.02
February	216,000	40,600	132,000	3.43	3.70
March	166,000	36,500	81,600	2.12	2.44
April [a]	232,000	35,100	119,000	3.09	3.45
May	50,600	19,200	29,500	.766	.88
June	37,800	19,700	25,900	.673	.75
July	122,000	17,400	57,500	1.49	1.72
August	68,500	14,900	24,800	.644	.74
September	18,700	10,200	12,900	.335	.37
The year	232,000	9,370	46,200	1.20	16.32

[a] Period of probable backwater extends over part or whole of month. See "Backwater" in station description.

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Monthly discharge of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1890–1913—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1897.					
October	14,900	10,200	12,200	0.317	0.37
November	60,400	10,200	22,200	.577	.64
December	90,600	21,700	46,400	1.21	1.40
January	75,200	19,200	40,400	1.05	1.21
February[a]	158,000	36,500	91,900	2.39	2.49
March[a]	410,000	174,000	289,000	7.51	8.66
April[a]	.....	48,400	168,000	4.36	4.86
May	153,000	31,800	72,500	1.88	2.17
June	31,800	20,700	26,400	.686	.77
July	66,100	22,800	32,200	.836	.96
August	55,800	17,000	24,100	.626	.72
September	16,500	9,090	11,500	.299	.33
The year	410,000	9,090	69,700	1.81	24.58
1898.					
October	11,500	8,560	9,290	.241	.28
November	11,200	9,090	10,300	.268	.30
December	98,400	9,370	38,300	.995	1.15
January[a]	.....	21,700	109,000	2.83	3.26
February[a]	.....	23,300	50,800	1.32	1.38
March[a]	.....	22,800	40,800	1.06	1.22
April[a]	.....	65,200	105,000	2.73	3.05
May	62,000	21,200	33,800	.878	1.01
June	32,500	14,100	20,200	.525	.59
July	30,600	14,100	19,900	.517	.60
August	101,000	22,200	55,600	1.44	1.66
September	126,000	20,200	43,300	1.12	1.25
The year	.....	8,560	44,600	1.16	15.75
1899.					
October	88,900	19,200	41,500	1.08	1.24
November	46,200	22,200	30,100	.782	.87
December	47,000	26,200	35,200	.914	1.05
January[a]	193,000	33,800	100,000	2.60	3.00
February	244,000	52,100	167,000	4.34	4.52
March[a]	335,000	183,000	248,000	6.44	7.42
April[a]	.....	62,000	150,000	3.90	4.35
May	89,800	27,400	54,600	1.42	1.64
June	33,800	18,700	25,400	.660	.74
July	24,500	13,700	17,400	.452	.52
August	25,000	11,500	16,700	.434	.50
September	14,900	9,650	11,700	.304	.34
The year	.....	9,650	74,300	1.93	26.19
1900.					
October	11,500	9,370	10,100	.262	.30
November	13,700	9,370	10,300	.268	.30
December	72,700	12,200	41,200	1.07	1.23
January	98,400	16,500	54,400	1.41	1.63
February	169,000	25,000	89,100	2.31	2.40
March	146,000	77,800	112,000	2.91	3.36
April	240,000	64,400	136,000	3.53	3.94
May	98,400	23,300	39,600	1.03	1.19
June	243,000	29,900	91,000	2.36	2.63
July	235,000	25,000	63,900	1.66	1.91
August	50,600	14,500	22,900	.595	.69
September	26,200	11,200	16,800	.436	.49
The year	243,000	9,370	57,000	1.48	20.07
1901.					
October	40,600	13,700	21,500	.558	.64
November	100,000	15,700	35,300	.917	1.02
December	113,000	25,600	49,500	1.29	1.49
January	194,000	37,200	94,600	2.46	2.84
February	141,000	31,800	76,000	1.97	2.05
March	149,000	26,800	65,100	1.69	1.95
April[a]	200,000	73,500	152,000	3.95	4.41
May[a]	182,000	33,800	84,600	2.20	2.54
June	176,000	40,600	67,400	1.75	1.95
July	55,800	17,400	29,500	.766	.88
August	226,000	15,700	102,000	2.65	3.06
September	103,000	33,100	61,000	1.58	1.76
The year	226,000	13,700	69,700	1.81	24.59

[a] Period of probable backwater extends over part or whole of month. See "Backwater" in station description.

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Monthly discharge of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1890–1913—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1902.					
October	35,100	16,500	24,600	0.639	0.74
November	16,500	14,900	15,500	.403	.45
December	183,000	15,300	74,200	1.93	2.22
January	234,000	40,600	129,000	3.35	3.86
February [a]	225,000	47,000	122,000	3.17	3.30
March [a]	283,000	87,200	184,000	4.78	5.51
April [a]	298,000	40,600	136,000	3.53	3.94
May	66,900	24,500	37,500	.974	1.12
June	34,400	17,400	21,400	.556	.62
July	52,800	14,100	24,500	.636	.73
August	19,700	10,800	13,700	.356	.41
September	16,500	10,500	12,300	.319	.36
The year	298,000	10,500	65,900	1.71	23.26
1903.					
October	23,900	11,500	17,600	.457	.53
November	38,500	10,500	14,700	.382	.43
December [a]	.....	42,700	78,900	2.05	2.36
January	82,900	35,100	59,800	1.55	1.79
February [a]	240,000	47,000	189,000	4.91	5.11
March [a]	.....	.....	190,000	4.94	5.70
April [a]	220,000	83,800	162,000	4.21	4.70
May	75,200	26,800	47,900	1.24	1.43
June	146,000	29,300	66,800	1.74	1.94
July	33,800	18,300	28,900	.699	.81
August	26,800	15,300	20,700	.538	.62
September	14,100	10,200	11,200	.291	.32
The year	.....	10,200	72,900	1.89	25.74
1904.					
October	11,200	9,370	10,000	.260	.30
November	28,600	9,370	15,600	.405	.45
December	36,500	10,500	17,300	.449	.52
January	77,800	14,500	31,200	.810	.93
February	49,900	22,200	30,700	.797	.86
March [a]	230,000	47,000	101,000	2.62	3.02
April [a]	.....	32,500	69,400	1.80	2.01
May	43,400	20,700	32,800	.852	.98
June	40,600	15,300	24,300	.631	.70
July	26,800	14,100	19,300	.501	.58
August	25,600	14,900	18,700	.486	.56
September	15,700	9,370	11,800	.306	.34
The year	.....	9,370	31,900	.829	11.25
1905.					
October	9,090	7,150	7,940	.206	.24
November	9,370	7,150	8,270	.215	.24
December	88,100	9,090	26,100	.678	.78
January	129,000	29,900	66,100	1.72	1.98
February	194,000	28,000	128,000	3.32	3.46
March [a]	168,000	49,100	101,000	2.62	3.02
April	49,100	33,100	39,300	1.02	1.14
May	158,000	44,800	78,000	2.03	2.34
June	62,000	20,700	35,500	.922	1.03
July	84,600	28,000	48,500	1.26	1.45
August	57,300	18,700	32,300	.839	.97
September	35,800	12,600	21,400	.556	.62
The year	194,000	7,150	48,900	1.27	17.27
1906.					
October	27,400	11,500	18,200	.473	.55
November	23,300	12,900	15,800	.410	.46
December	121,000	15,700	68,900	1.79	2.06
January	177,000	62,000	104,000	2.70	3.11
February	137,000	31,200	53,600	1.39	1.45
March	131,000	43,400	87,700	2.28	2.63
April [a]	.....	44,100	87,200	2.26	2.52
May	53,500	22,800	36,300	.943	1.09
June	50,600	22,200	32,100	.834	.93
July	115,000	22,800	60,400	1.57	1.81
August	64,400	38,500	48,300	1.25	1.44
September	86,300	34,400	59,000	1.53	1.71
The year	177,000	11,500	56,000	1.45	19.76

[a] Period of probable backwater extends over part or whole of month. See "Backwater" in station description.

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Monthly discharge of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1890–1913—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1907.					
October	205,000	42,000	103,000	2.68	3.09
November [a]	201,000	22,800	92,800	2.41	2.69
December	116,000	39,900	66,000	1.71	1.97
January [a]	.....	.....	85,800	2.23	2.57
February [a]	.....	39,900	79,900	2.08	2.17
March [a]	206,000	.....	123,000	3.19	3.68
April [a]	77,800	40,600	58,000	1.51	1.68
May	176,000	39,200	112,000	2.91	3.36
June	93,200	42,000	62,100	1.61	1.80
July	44,100	22,800	34,200	.888	1.02
August	29,900	21,200	23,800	.618	.71
September	64,400	18,700	26,400	.686	.77
The year	206,000	18,700	72,300	1.88	25.51
1908.					
October	58,800	14,500	24,100	.626	.72
November	95,800	14,100	38,100	.990	1.10
December	91,500	30,600	50,100	1.30	1.50
January	167,000	49,100	111,000	2.88	3.32
February [a]	.....	51,300	135,000	3.51	3.79
March [a]	.....	.....	110,000	2.86	3.30
April [a]	.....	.....	84,300	2.19	2.44
May [a]	127,000	47,000	74,600	1.94	2.24
June	62,000	25,000	41,100	1.07	1.19
July	46,200	20,200	30,600	.795	.92
August	39,900	18,700	25,400	.660	.76
September	38,500	14,900	24,000	.623	.70
The year	.....	14,100	62,100	1.61	21.98
1909.					
October	17,400	11,500	13,400	.348	.40
November	31,200	17,000	21,200	.551	.61
December	98,400	16,500	55,800	1.45	1.67
January	133,000	46,200	79,100	2.05	2.36
February	274,000	39,900	143,000	3.71	3.86
March	274,000	111,000	192,000	4.99	5.75
April	135,000	58,100	95,000	2.47	2.76
May [a]	180,000	59,600	111,000	2.88	3.32
June	185,000	82,900	120,000	3.12	3.48
July	126,000	38,500	74,500	1.94	2.24
August	66,900	23,300	40,900	1.06	1.22
September	28,000	17,800	21,000	.545	.61
The year	274,000	11,500	80,300	2.09	28.28
1910.					
October	37,200	14,900	22,400	.582	.67
November	17,000	14,900	15,600	.405	.45
December	40,600	15,700	27,100	.704	.81
January [a]	101,000	23,300	66,500	1.73	1.99
February [a]	168,000	31,800	76,900	2.00	2.08
March [a]	126,000	26,200	65,700	1.71	1.97
April	111,000	20,200	45,300	1.18	1.32
May	128,000	28,600	62,900	1.63	1.88
June	107,000	41,300	63,400	1.65	1.84
July	119,000	44,100	81,200	2.11	2.43
August	45,500	21,200	32,300	.839	.97
September	51,300	16,500	27,800	.722	.81
The year	168,000	14,900	48,800	1.27	17.22
1911.					
October	25,000	13,300	17,800	.462	.53
November	14,100	11,500	12,600	.327	.36
December	74,400	14,160	31,000	.805	.93
January	202,000	34,480	89,300	2.32	2.68
February [a]	209,000	52,800	118,000	3.06	3.19
March	126,000	39,200	60,400	1.57	1.81
April [a]	302,000	62,800	211,000	5.48	6.11
May	85,500	29,900	49,500	1.29	1.49
June	28,000	16,500	20,900	.543	.61
July	44,100	17,800	26,800	.696	.80
August	33,100	17,400	24,900	.647	.75
September	21,700	12,900	16,300	.423	.47
The year	302,000	11,500	56,000	1.45	19.73

[a] Period of probable backwater extends over part or whole of month. See "Backwater" in station description.

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Monthly discharge of Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1890–1913—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
1912.					
October	41,300	11,800	21,700	0.564	0.65
November	39,200	15,700	26,700	.694	.77
December [a]	239,000	22,200	104,000	2.70	3.11
January [a]	257,000	54,300	117,000	3.04	3.50
February [a]	211,000	41,300	103,000	2.68	2.89
March [a]	.....	.....	170,000	4.42	5.10
April [a]	.....	.....	190,000	4.94	5.51
May [a]	.....	42,700	120,000	3.12	3.60
June	76,900	28,600	42,400	1.10	1.23
July	92,400	33,100	57,400	1.49	1.72
August	42,700	26,800	32,500	.844	.97
September	40,600	14,900	22,500	.584	.65
The year	.....	11,800	84,000	2.18	29.70
1913.					
October	33,800	14,500	19,800	.514	.59
November	20,200	14,100	16,000	.416	.46
December	77,800	13,700	39,400	1.02	1.18
January [a]	.....	44,100	161,000	4.18	4.82
February [a]	.....	60,400	131,000	3.40	3.54
March [a]	.....	67,700	184,000	4.78	5.51
April [a]	.....	42,700	119,000	3.09	3.45
May	104,000	29,300	44,000	1.14	1.31
June	93,200	23,900	49,400	1.28	1.43
July	24,500	15,300	19,500	.506	.58
August	20,200	14,500	17,300	.449	.52
September	16,500	11,200	12,700	.330	.37
The year	.....	11,200	67,500	1.75	23.76

[a] Period of probable backwater extends over part or whole of month. See "Backwater" in station description.

Discharge and horsepower table for Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1890–1913.

Gage height.	Discharge in second-feet.	Theoretical horsepower per foot of fall.	Days of deficient discharge.											
			1890	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900	1901
−0.98	7,000	795	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
− .83	7,300	830	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
− .69	7,600	864	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
− .52	8,000	909	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
− .32	8,500	966	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
− .13	9,000	1,020	.....	.....	.....	.....	.....	.....	.....	.....	18	.....	.....	.....
+ .05	9,500	1,080	.....	.....	.....	.....	.....	.....	5	7	26	.....	8	.....
.22	10,000	1,140	.....	.....	.....	.....	.....	9	30	12	39	4	34	.....
.55	11,000	1,250	.....	.....	.....	.....	.....	47	47	34	58	10	54	.....
.85	12,000	1,360	.....	.....	.....	.....	.....	68	65	51	65	21	64	.....
1.38	14,000	1,590	.....	.....	31	16	9	78	108	62	65	36	78	2
1.87	16,000	1,820	8	1	45	36	35	84	118	70	82	63	104	13
2.76	20,000	2,270	32	13	53	63	133	115	144	91	109	85	119	44
3.69	25,000	2,840	64	43	69	107	183	153	183	129	166	117	130	64
4.51	30,000	3,410	116	117	102	135	225	177	208	179	211	155	165	86
5.28	35,000	3,980	136	154	122	158	245	188	222	197	232	181	181	108
6.01	40,000	4,550	170	183	141	188	256	208	252	216	246	204	194	139
7.42	50,000	5,680	192	215	166	206	267	245	273	236	258	221	209	179
Over 7.42	Over 50,000	Over 5,680	365	365	366	365	365	365	366	365	365	365	365	365

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Discharge and horsepower table for Tennessee River at Johnsonville, Tenn., for the years ending Sept. 30, 1890–1913—Continued.

Gage height.	Discharge in second-feet.	Theoretical horsepower per foot of fall.	Days of deficient discharge.											
			1902	1903	1904	1905	1906	1907	1908	1909	1910	1911	1912	1913
−0.98	7,000	795	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
− .83	7,300	830	.....	.....	.....	10	.....	.....	.....	.....	.....	.....	.....	.....
− .69	7,600	864	.....	.....	.....	19	.....	.....	.....	.....	.....	.....	.....	.....
− .52	8,000	909	.....	.....	.....	22	.....	.....	.....	.....	.....	.....	.....	.....
− .32	8,500	966	.....	.....	.....	41	.....	.....	.....	.....	.....	.....	.....	.....
− .13	9,000	1,020	.....	.....	.....	53	.....	.....	.....	.....	.....	.....	.....	.....
+ .05	9,500	1,080	.....	.....	13	63	.....	.....	.....	.....	.....	.....	.....	.....
.22	10,000	1,140	.....	.....	28	65	.....	.....	.....	.....	.....	.....	.....	.....
.55	11,000	1,250	11	27	59	67	.....	.....	.....	.....	.....	9	1	11
.85	12,000	1,360	28	43	74	67	8	.....	.....	3	.....	9	1	11
1.38	14,000	1,590	40	58	93	71	23	.....	.....	22	.....	42	7	25
1.87	16,000	1,820	91	67	128	81	33	.....	13	27	35	59	20	70
2.76	20,000	2,270	134	96	174	95	48	10	41	58	61	110	47	134
3.69	25,000	2,840	170	124	218	126	76	50	75	94	101	167	58	156
4.51	30,000	3,410	196	149	254	149	100	81	118	103	130	189	85	176
5.28	35,000	3,980	208	166	273	183	122	89	139	112	161	206	127	195
6.01	40,000	4,550	213	179	298	211	149	101	158	124	198	231	155	206
7.42	50,000	5,680	234	201	315	243	199	148	186	144	242	256	181	221
Over 7.42	Over 50,000	Over 5,680	365	365	366	365	365	365	366	365	365	365	366	365

NOTE.—The above table gives the theoretical horsepower per foot fall that may be developed at different rates of discharge and shows the number of days on which the discharge and corresponding horsepower were respectively less than the amounts given in the columns for discharge and horsepower. In using this table, allowance should be made for the various losses, the principal ones being the wheel loss, which may be as large as 20 per cent, and the head loss, which may be as large as 5 per cent.

SOUTH FORK OF HOLSTON RIVER AT BLUFF CITY, TENN.

Location.—At highway bridge at Bluff City, Tenn., 300 feet below Virginia & Southwestern Railway bridge, 1 mile below the mouth of Indian Creek, and about 10 miles above mouth of Watauga River.

Records available.—July 17, 1900, to September 30, 1913.

Drainage area.—828 square miles.

Gage.—Vertical staff attached to downstream side of bridge pier nearest the right bank; read once daily to tenths.

Control.—Shallow ledge; probably permanent. Depth and velocity of current very irregular.

Discharge measurements.—Made from downstream side of bridge; also from railroad bridge 300 feet above, where the section is much better except at low stages, when the current becomes sluggish.

Floods.—The flood of June 14, 1907, reached a stage of 11.7 feet.

Winter flow.—Not affected by ice. "Frozen," reported by observer has probably referred to water at foot of gage rather than in channel.

Accuracy.—No discharge measurements were made during the year ending September 30, 1913, consequently the accuracy of the estimates of discharge in the following tables depends on the permanency of the gage and of the discharge relation.

Cooperation.—Since January 1, 1905, gage heights have been furnished by the United States Weather Bureau.

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Daily gage height, in feet, of South Fork of Holston River at Bluff City, Tenn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	0.6	0.4	0.3	2.2	3.0	3.4	2.9	1.5	2.4	0.7	0.4	1.1
2	.5	.5	.4	1.7	2.6	2.7	2.6	1.4	2.2	.7	.5	.8
3	.5	.4	.4	1.6	2.4	2.1	2.4	1.4	1.9	.7	.7	.7
4	.5	.3	.6	1.6	3.3	1.9	2.2	1.3	1.7	1.3	.6	.6
5	.4	.3	1.5	1.6	3.3	1.8	2.1	1.1	1.9	1.4	.4	.6
6	.4	.3	1.5	1.8	2.9	1.7	1.9	1.1	1.9	1.3	.4	.5
7	.4	.5	1.4	2.1	2.5	1.5	1.8	1.1	1.8	1.1	.3	.4
8	.4	1.6	1.2	2.0	2.2	1.4	1.8	1.1	3.1	.8	.9	.5
9	.4	1.3	1.0	2.3	2.0	1.3	1.8	1.1	2.3	.7	.6	.5
10	.3	1.0	.9	2.0	1.9	1.4	1.7	1.0	1.9	.6	.4	.6
11	.3	.8	.8	1.8	1.9	1.7	1.6	1.0	1.7	.6	.3	.4
12	.3	.7	.7	1.9	3.0	2.0	2.8	.9	1.5	.7	.3	.4
13	.3	.6	.5	2.5	2.5	1.9	2.6	.9	1.6	1.1	.3	.3
14	.4	.7	.3	2.4	2.2	6.2	2.8	.9	1.4	.8	1.2	.3
15	.7	.7	.3	2.1	2.0	7.4	2.8	.9	1.3	.6	1.0	.2
16	.7	.6	.4	1.8	1.9	6.5	2.6	1.0	1.2	.7	.9	.4
17	.5	.6	.6	1.6	1.8	4.4	2.5	1.1	1.1	.6	.6	.4
18	.4	.6	.6	1.6	1.6	3.4	2.4	1.2	1.1	.6	.4	.4
19	.6	.6	.6	1.8	1.5	2.9	2.1	1.3	1.1	.5	.4	.5
20	.6	.5	.5	1.6	1.5	2.6	1.9	1.1	1.0	.6	.5	.5
21	.5	.5	.5	1.6	1.6	2.4	1.8	1.1	1.0	1.0	.5	.7
22	.4	.5	.4	1.8	1.5	2.8	1.7	1.8	.9	.6	.4	1.9
23	.5	.5	.4	2.0	1.4	2.4	1.6	2.6	.9	.5	.6	1.4
24	.6	.4	.6	2.0	1.4	2.2	1.5	6.6	1.0	.5	1.3	1.0
25	.5	.4	.6	3.7	1.4	2.0	1.4	4.4	1.2	.5	1.0	.8
26	.4	.4	.5	3.9	1.3	1.9	1.4	3.0	1.2	.5	.6	.6
27	.4	.5	.3	3.6	1.8	9.1	1.4	3.2	1.0	.5	.4	.6
28	.4	.4	.5	5.5	3.4	7.7	1.6	6.1	.9	.4	.4	.5
29	.4	.4	.6	4.1	.....	4.8	1.5	4.4	.9	.6	.4	.5
30	.4	.3	.9	3.3	.....	3.8	1.5	3.3	.8	.5	.6	.7
31	.4	.....	2.4	2.8	.....	3.3	.....	2.7	.....	.4	1.8	.....

Daily discharge, in second-feet, of South Fork of Holston River at Bluff City, Tenn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	420	325	285	1,680	2,630	3,180	2,500	1,020	1,900	475	325	715
2	370	370	325	1,190	2,130	2,250	2,130	940	1,680	475	370	530
3	370	325	325	1,100	1,900	1,580	1,900	940	1,380	475	475	475
4	370	285	420	1,100	3,040	1,380	1,680	860	1,190	860	420	420
5	325	285	1,020	1,100	3,040	1,280	1,580	715	1,380	940	325	420
6	325	285	1,020	1,280	2,500	1,190	1,380	715	1,380	860	325	370
7	325	370	940	1,580	2,010	1,020	1,280	715	1,280	715	285	325
8	325	1,100	785	1,480	1,680	940	1,280	715	2,760	530	590	370
9	325	860	650	1,790	1,480	860	1,280	715	1,790	475	420	370
10	285	650	590	1,480	1,380	940	1,190	650	1,380	420	325	420
11	285	530	530	1,280	1,380	1,190	1,100	650	1,190	420	285	325
12	285	475	475	1,380	2,630	1,480	2,370	590	1,020	475	285	325
13	285	420	370	2,010	2,010	1,380	2,130	590	1,100	715	285	285
14	325	475	285	1,900	1,680	8,270	2,370	590	940	530	785	285
15	475	475	285	1,580	1,480	11,100	2,370	590	860	420	650	245
16	475	420	325	1,280	1,380	8,950	2,130	650	785	475	590	325
17	370	420	420	1,100	1,280	4,730	2,010	715	715	420	420	325
18	325	420	420	1,100	1,100	3,180	1,900	785	715	420	325	325
19	420	420	420	1,280	1,020	2,500	1,580	860	715	370	325	370
20	420	370	370	1,100	1,020	2,130	1,380	715	650	420	370	370
21	370	370	370	1,100	1,100	1,900	1,280	715	650	650	370	475
22	325	370	325	1,280	1,020	2,370	1,190	1,280	590	420	325	1,380
23	370	370	325	1,480	940	1,900	1,100	2,130	590	370	420	940
24	420	325	420	1,480	940	1,680	1,020	9,180	650	370	860	650
25	370	325	420	3,610	940	1,480	940	4,730	785	370	650	530
26	325	325	370	3,910	860	1,380	940	2,630	785	370	420	420
27	325	370	285	3,460	1,280	15,100	940	2,900	650	370	325	420
28	325	325	370	6,780	3,180	11,800	1,100	8,050	590	325	325	370
29	325	325	420	4,220	.....	5,440	1,020	4,730	590	420	325	370
30	325	285	590	3,040	.....	3,760	1,020	3,040	530	370	420	475
31	325	.....	1,900	2,370	.....	3,040	.....	2,250	.....	325	1,280	.....

NOTE.—Daily discharge computed from a rating curve fairly well defined below 3,320 second-feet (gage height, 3.5 feet). See "Accuracy" in station description.

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Monthly discharge of South Fork of Holston River at Bluff City, Tenn., for the year ending Sept. 30, 1913.

[Drainage area, 828 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	475	285	352	0.425	0.49	C.
November	1,100	285	422	.510	.57	B.
December	1,900	285	518	.626	.72	B.
January	6,780	1,100	1,950	2.36	2.72	B.
February	3,180	860	1,680	2.03	2.11	B.
March	15,100	860	3,530	4.26	4.91	C.
April	2,500	940	1,540	1.86	2.08	B.
May	9,180	590	1,820	2.20	2.54	B.
June	2,760	530	1,040	1.26	1.41	B.
July	940	325	592	.594	.68	C.
August	1,280	285	448	.541	.62	C.
September	1,380	245	454	.548	.61	C.
The year	15,100	245	1,190	1.44	19.46	

HOLSTON RIVER NEAR ROGERSVILLE, TENN.

Location.—At Virginia & Southwestern Railway bridge near Austins Mill, a small railway station 3 miles south of Rogersville, 150 feet below mouth of Honeycut Creek and about 2 miles below Dodson Creek, both small streams from the south.

Records available.—March 10, 1902, to September 30, 1913. Discharge measurements were begun in 1904 by the United States Geological Survey. No gage heights or estimates of flow have been published by the United States Geological Survey prior to January 1, 1904, but it is thought that the 1904 discharge rating curve is applicable to the United States Weather Bureau gage heights back to the beginning.

Drainage area.—3,060 square miles.

Gage.—Vertical staff attached to downstream side of bridge pier nearest the right bank, read once daily to tenths.

Control.—Practically permanent. Section good for measurements.

Discharge measurements.—Made from top of the high-decked steel railroad bridge.

Floods.—The flood of March 28, 1913, reached a maximum height of 19.1 feet by the gage datum.

Winter flow.—Not affected by ice to any considerable extent.

Accuracy.—This station was not visited by engineers of the Geological Survey during the year ending September 30, 1913, and the last discharge measurement at the station was made June 21, 1912. Nothing is known as to the effect of the flood of March 28, 1913, on the discharge relation or of the permanency of the gage since last inspected. Therefore no estimates of discharge subsequent to that date have been prepared for publication.

Cooperation.—Gage maintained and gage-height records furnished by the United States Weather Bureau.

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Daily gage height, in feet, of Holston River near Rogersville, Tenn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.8	1.5	1.5	4.0	4.1	5.0	4.5	2.4	4.0	1.8	1.7	1.9
2	1.8	1.6	1.5	3.2	4.1	4.3	4.0	2.3	3.4	2.1	1.8	1.9
3	1.8	1.6	1.6	2.8	3.6	3.8	3.8	2.5	3.4	1.9	2.0	1.8
4	1.7	1.5	2.0	2.8	4.0	3.3	3.6	2.4	3.0	1.9	1.9	1.7
5	1.7	1.5	2.6	2.8	4.3	3.1	3.4	2.4	3.3	2.1	1.8	1.7
6	1.7	1.5	3.1	2.8	4.0	3.0	3.4	2.3	3.2	2.2	1.7	1.6
7	1.6	1.6	2.7	3.8	3.8	2.8	3.3	2.4	2.9	2.1	1.7	1.9
8	1.6	2.2	2.4	3.7	3.3	2.5	3.1	2.4	2.9	1.9	3.7	1.8
9	1.6	2.8	2.1	4.2	3.1	2.4	3.0	2.4	3.8	1.8	2.6	1.8
10	1.6	2.4	2.1	3.8	3.0	2.4	3.0	2.3	3.2	1.7	2.0	1.8
11	1.6	2.0	2.0	3.3	3.0	2.6	2.8	2.3	3.0	1.7	1.9	1.7
12	1.6	1.8	1.9	3.5	4.0	3.1	2.7	2.2	2.7	1.7	1.8	1.7
13	1.6	1.7	1.9	3.9	4.3	3.1	3.8	2.2	2.5	1.9	1.8	1.7
14	1.7	1.7	1.8	4.0	3.6	5.2	4.0	2.1	2.5	1.9	1.7	1.6
15	1.9	1.7	1.8	3.5	3.4	12.0	3.9	2.0	2.4	1.8	1.8	1.6
16	1.9	1.8	1.6	3.1	3.2	12.2	3.9	2.0	2.4	1.9	2.2	1.7
17	1.8	1.7	1.6	2.9	3.1	7.7	3.9	2.6	2.3	1.8	2.0	1.6
18	1.8	1.7	1.7	3.0	2.9	5.3	3.7	3.0	2.2	1.8	1.8	1.7
19	1.8	1.7	1.7	3.2	2.7	4.5	3.5	2.8	2.2	1.8	1.7	1.9
20	1.7	1.7	1.7	3.1	2.5	4.0	3.3	2.5	2.2	1.8	1.8	1.9
21	1.8	1.6	1.6	3.5	2.6	3.8	3.0	2.4	2.1	1.8	1.7	2.0
22	1.7	1.6	1.6	3.7	2.6	4.0	2.8	2.3	2.0	1.9	1.8	2.0
23	1.6	1.5	1.6	3.7	2.6	3.9	2.8	3.0	2.0	1.9	1.9	2.8
24	1.6	1.5	1.7	4.0	2.5	3.6	2.7	5.8	2.0	1.8	2.0	2.2
25	1.6	1.5	1.6	5.9	2.5	3.4	2.7	7.0	2.0	1.7	2.2	2.0
26	1.6	1.5	1.6	5.9	2.4	3.3	2.6	4.7	2.2	1.7	1.9	1.9
27	1.6	1.5	1.6	5.5	3.6	7.4	2.4	4.4	2.1	1.8	1.8	1.8
28	1.6	1.5	1.7	7.8	4.8	19.1	2.4	6.8	2.0	1.8	1.8	1.8
29	1.6	1.6	1.7	6.5	.....	8.5	2.4	6.5	1.9	1.8	1.7	1.8
30	1.6	1.6	2.3	5.0	.....	5.8	2.4	4.9	1.9	1.8	1.7	1.7
31	1.6	.....	3.2	4.3	.....	5.0	.....	4.2	.....	1.7	2.0	.....

Daily discharge, in second-feet, of Holston River near Rogersville, Tenn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
1	1,570	1,030	1,030	7,150	7,470	10,600	16	1,760	1,570	1,210	4,500	4,770	39,400
2	1,570	1,210	1,030	4,770	7,470	8,120	17	1,570	1,390	1,210	3,970	4,500	21,400
3	1,570	1,210	1,210	3,720	5,930	6,530	18	1,570	1,390	1,390	4,230	3,970	11,800
4	1,390	1,030	1,950	3,720	7,150	5,050	19	1,570	1,390	1,390	4,770	3,470	8,800
5	1,390	1,030	3,230	3,720	8,120	4,500	20	1,390	1,390	1,390	4,500	3,000	7,150
6	1,390	1,030	4,500	3,720	7,150	4,230	21	1,570	1,210	1,210	5,630	3,230	6,530
7	1,210	1,210	3,470	6,530	6,530	3,720	22	1,390	1,210	1,210	6,230	3,230	7,150
8	1,210	2,350	2,780	6,230	5,050	3,000	23	1,210	1,030	1,210	6,230	3,230	6,840
9	1,210	3,720	2,150	7,790	4,500	2,780	24	1,210	1,030	1,390	7,150	3,000	5,930
10	1,210	2,780	2,150	6,530	4,230	2,780	25	1,210	1,030	1,210	14,200	3,000	5,340
11	1,210	1,950	1,950	5,050	4,230	3,230	26	1,210	1,030	1,210	14,200	2,780	5,050
12	1,210	1,570	1,780	5,630	7,150	4,500	27	1,210	1,030	1,210	12,600	5,930	20,200
13	1,210	1,390	1,780	6,840	8,120	4,500	28	1,210	1,030	1,390	21,800	9,850	.....
14	1,390	1,390	1,570	7,150	5,930	11,400	29	1,210	1,210	1,390	16,600	.....	.....
15	1,760	1,390	1,570	5,630	5,340	38,600	30	1,210	1,210	2,560	10,600	.....	.....
							31	1,210	.....	4,770	8,120	.....	.....

NOTE.—Daily discharge computed from a rating curve fairly well defined between 1,030 and 12,600 second-feet (gage heights 1.5 and 5.5 feet), and assumed as a tangent above 10,600 second-feet (gage height 5.0 feet). See "Accuracy" in station description.

Monthly discharge of Holston River near Rogersville, Tenn., for the year ending Sept. 30, 1913.

[Drainage area, 3,060 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	1,760	1,210	1,360	0.444	0.51	B.
November	3,720	1,030	1,410	.461	.51	B.
December	4,770	1,030	1,850	.605	.70	B.
January	21,800	3,720	7,400	2.42	2.79	B.
February	9,850	2,780	5,300	1.73	1.80	B.

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Monthly discharge of South Fork of Holston River at Bluff City, Tenn., for the year ending Sept. 30, 1913.

[Drainage area, [illegible] square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	473	285	332	0.425	0.49	C.
November	1,100	285	422	.510	.57	B.
December	1,800	285	518	.626	.72	B.
January	6,780	1,100	1,950	2.36	2.72	B.
February	3,180	860	1,680	2.03	2.11	B.
March	15,100	860	3,530	4.26	4.91	C.
April	2,500	940	1,540	1.86	2.08	B.
May	6,180	590	1,820	2.20	2.54	B.
June	2,780	530	1,040	1.26	1.41	B.
July	940	325	592	.594	.68	C.
August	1,280	285	448	.541	.62	C.
September	1,380	245	454	.548	.61	C.
The year	15,100	245	1,190	1.44	19.46	

HOLSTON RIVER NEAR ROGERSVILLE, TENN.

Location.—At Virginia & Southwestern Railway bridge near Austins Mill, a small railway station 3 miles south of Rogersville, 150 feet below mouth of Honeycut Creek and about 2 miles below Dodson Creek, both small streams from the south.

Records available.—March 10, 1902, to September 30, 1913. Discharge measurements were begun in 1904 by the United States Geological Survey. No gage heights or estimates of flow have been published by the United States Geological Survey prior to January 1, 1904, but it is thought that the 1904 discharge rating curve is applicable to the United States Weather Bureau gage heights back to the beginning.

Drainage area.—3,060 square miles.

Gage.—Vertical staff attached to downstream side of bridge pier nearest the right bank, read once daily to tenths.

Control.—Practically permanent. Section good for measurements.

Discharge measurements.—Made from top of the high-decked steel railroad bridge.

Floods.—The flood of March 28, 1913, reached a maximum height of 19.1 feet by the gage datum.

Winter flow.—Not affected by ice to any considerable extent.

Accuracy.—This station was not visited by engineers of the Geo[illegible] ing the year ending September 30, 1913, and the l[illegible] the station was made June 21, 1912. Nothing [illegible] flood of March 28, 1913, on the discharge [illegible] gage since last inspected. Therefore [illegible] date have been prepared for publ[illegible]

Cooperation.—Gage maintained [illegible] States Weather Bureau.

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Daily gage height, in feet, of Holston River near Rogersville, Tenn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.8	1.5	1.5	4.0	4.1	5.0	4.5	2.4	4.0	1.8	1.7	1.9
2	1.8	1.6	1.5	3.2	4.1	4.3	4.0	2.3	3.4	2.1	1.8	1.9
3	1.8	1.6	1.6	2.8	3.6	3.8	3.8	2.5	3.4	1.9	2.0	1.8
4	1.7	1.5	2.0	2.8	4.0	3.3	3.6	2.4	3.0	1.9	1.9	1.7
5	1.7	1.5	2.6	2.8	4.3	3.1	3.4	2.4	3.3	2.1	1.8	1.7
6	1.7	1.5	3.1	2.8	4.0	3.0	3.4	2.3	3.2	2.2	1.7	1.6
7	1.6	1.6	2.7	2.8	3.8	2.8	3.3	2.4	2.9	2.1	1.7	1.9
8	1.6	2.2	2.4	2.7	3.3	2.5	3.1	2.4	2.9	1.9	2.7	1.8
9	1.6	2.8	2.1	4.2	3.1	2.4	3.0	2.4	2.8	1.8	2.6	1.8
10	1.6	2.4	2.1	3.8	3.0	2.4	3.0	2.3	3.2	1.7	2.0	1.8
11	1.6	2.0	2.0	3.3	3.0	2.6	2.8	2.3	3.0	1.7	1.9	1.7
12	1.6	1.8	1.9	3.5	4.0	3.1	2.7	2.2	2.7	1.7	1.8	1.7
13	1.6	1.7	1.9	3.9	4.3	3.1	3.8	2.2	2.5	1.9	1.8	1.7
14	1.7	1.7	1.8	4.0	3.6	5.2	4.0	2.1	2.5	1.9	1.7	1.6
15	1.9	1.7	1.8	3.5	3.4	12.0	3.9	2.0	2.4	1.8	1.8	1.6
16	1.9	1.8	1.6	3.1	3.2	12.2	3.9	2.0	2.4	1.9	2.2	1.7
17	1.8	1.7	1.6	2.9	3.1	7.7	3.9	2.6	2.3	1.8	2.0	1.6
18	1.8	1.7	1.7	3.0	2.9	5.3	3.7	2.0	2.2	1.8	1.8	1.7
19	1.8	1.7	1.7	3.2	2.7	4.5	3.5	2.8	2.2	1.8	1.7	1.9
20	1.7	1.7	1.7	3.1	2.5	4.0	3.3	2.5	2.2	1.8	1.8	1.9
21	1.8	1.6	1.6	3.5	2.6	3.8	3.0	2.4	2.1	1.8	1.7	2.0
22	1.7	1.6	1.6	3.7	2.6	4.0	2.8	2.3	2.0	1.9	1.8	2.0
23	1.6	1.5	1.6	3.7	2.6	3.9	2.8	2.0	2.0	1.9	1.9	2.8
24	1.6	1.5	1.7	4.0	2.5	3.6	2.7	5.8	2.0	1.8	2.0	2.2
25	1.6	1.5	1.6	5.9	2.5	3.4	2.7	7.0	2.0	1.7	2.2	2.0
26	1.6	1.5	1.6	5.9	2.4	3.3	2.6	4.7	2.2	1.7	1.9	1.9
27	1.6	1.5	1.6	5.5	3.6	7.4	2.4	4.4	2.1	1.8	1.8	1.8
28	1.6	1.5	1.7	7.8	4.8	19.1	2.4	6.8	2.0	1.8	1.8	1.8
29	1.6	1.6	1.7	6.5	.....	8.5	2.4	6.5	1.9	1.8	1.7	1.8
30	1.6	1.6	2.3	5.0	.....	5.8	2.4	4.9	1.9	1.8	1.7	1.7
31	1.6	.....	3.2	4.3	.....	5.0	.....	4.2	.....	1.7	2.0	.....

Daily discharge, in second-feet, of Holston River near Rogersville, Tenn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
1	1,570	1,030	1,030	7,150	7,4[illegible]	[illegible]	16	[illegible]	[illegible]	1,210	4,500	4,770	39,400
2	1,570	1,210	1,030	4,770	[illegible]	[illegible]	17	[illegible]	[illegible]	1,210	3,970	4,500	21,400
3	1,570	1,210	1,21[illegible]	[illegible]	[illegible]	[illegible]	18	[illegible]	[illegible]	1,390	4,230	3,970	11,800
4	1,390	1,030	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible],390	4,770	3,470	8,800
5	1,390	1,030	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible],390	4,500	3,000	7,150
6	1,390	1,030	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,210	5,630	3,230	6,530
7	1,210	1,21[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,210	6,230	3,230	7,150
8	1,210	2,3[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,210	6,230	3,230	6,840
9	1,210	3,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,390	7,150	3,000	5,930
10	1,210	2[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,210	14,200	3,000	5,340
11	1,210	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,210	14,200	2,780	5,050
12	1,21[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,210	12,600	5,930	20,200
13	1,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,390	21,800	9,850	[illegible]
14	1[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,390	16,600	[illegible]	[illegible]
15	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2,560	10,600	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4,770	8,120	[illegible]	[illegible]

Note: [illegible] ined between 1,030 and 12,600 [illegible] e 10,500 second-feet (gage height [illegible]

[illegible] for the year ending Sept. 30, [illegible]

[illegible]

[illegible] nd-feet.		Run-off (depth in inches on drainage area).	Accuracy.
Mean.	Per square mile.		
1,360	0.444	0.51	B.
1,410	.461	.51	B.
1,850	.605	.70	B.
7,400	2.42	2.70	B.
5,300	1.73	1.80	B.

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DOE RIVER AT BLEVINS, TENN.

Location.—At Eastern Tennessee & Western Northern Carolina Railroad bridge, one-fourth mile west of Blevins, Tenn., 4½ miles above the mouth of Little Doe River.

Records available.—December 16, 1911, to September 30, 1913.

Drainage area.—62.2 square miles.

Gage.—Standard chain gage attached to bridge; read daily, morning and evening, to hundredths. Limits of use: Hundredths below 3.5, half tenths from 3.5 to 5.0, and tenths above 5.0 feet.

Control.—Practically permanent.

Discharge measurements.—Made from upstream side of bridge or by wading at section about one-fourth mile above bridge.

Point of zero flow.—A determination by leveling September 10, 1912, indicates that there would be no flow past the gage if the river were to fall to a stage of about 1.2 feet.

Winter flow.—Discharge relation may be occasionally affected by ice but only for short periods during unusually severe winters.

Accuracy.—Data insufficient for estimates of discharge.

No discharge measurements were made at this station during the year ending September 30, 1913.

Daily gage height, in feet, of Doe River at Blevins, Tenn., for the year ending Sept. 30, 1913.

[O. L. Wright, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.74	1.72	2.00	1.98	2.02	2.35	2.28	2.21	2.25	1.85	1.75	1.85
2	1.72	1.72	1.99	1.93	2.00	2.20	2.24	2.14	2.18	1.87	2.09	1.80
3	1.72	1.71	1.88	1.97	2.02	2.15	2.20	2.10	2.15	2.02	2.03	1.80
4	1.72	1.72	1.88	1.96	2.05	2.10	2.18	2.07	2.22	1.98	1.90	1.88
5	1.70	1.69	1.92	1.95	2.07	2.10	2.12	2.05	2.18	1.89	1.78	1.85
6	1.70	1.70	1.92	2.00	2.09	2.09	2.09	2.06	2.15	1.85	1.76	1.82
7	1.70	2.52	1.88	2.03	2.08	2.10	2.08	2.06	2.31	1.84	2.40	1.80
8	1.70	2.06	1.82	2.00	2.08	2.11	2.10	2.15	2.45	1.82	2.25	1.78
9	1.70	1.95	1.79	1.95	2.10	1.98	2.10	2.04	2.38	1.80	2.01	1.80
10	1.69	1.86	1.81	1.96	2.11	2.18	2.05	2.00	2.22	1.80	1.95	1.78
11	1.70	1.83	1.80	1.92	2.15	2.09	2.14	2.00	2.10	1.79	1.90	1.75
12	1.68	1.80	1.75	2.02	1.98	2.08	2.37	1.99	2.08	1.95	1.86	1.76
13	1.70	1.82	1.71	2.00	1.92	2.15	2.50	1.99	2.05	1.90	1.80	1.76
14	1.81	1.87	1.66	2.02	1.94	4.3	2.57	1.98	2.00	1.86	1.92	1.77
15	1.80	1.82	1.64	2.00	1.95	4.2	2.48	1.97	1.98	1.79	1.84	1.78
16	1.70	1.79	1.61	1.96	1.90	3.05	2.48	2.00	1.95	1.80	1.85	1.80
17	1.70	1.78	1.63	1.98	1.95	2.50	2.45	2.13	1.96	1.89	1.80	1.78
18	1.70	1.79	1.75	2.01	1.93	2.35	2.33	2.06	2.00	1.82	1.82	1.90
19	1.77	1.78	1.80	2.00	1.93	2.25	2.25	2.02	1.98	1.75	1.80	1.88
20	1.72	1.74	1.80	2.00	2.03	2.25	2.20	1.99	1.94	1.80	1.80	1.84
21	1.66	1.76	1.80	2.01	2.00	2.65	2.13	2.00	1.90	1.77	1.79	1.93
22	1.70	1.76	1.78	2.05	1.98	2.33	2.11	2.00	1.93	1.75	1.87	2.01
23	1.74	1.75	1.82	2.02	1.95	2.25	2.10	2.49	1.92	1.75	2.05	1.90
24	1.67	1.72	1.80	2.05	1.96	2.20	2.09	3.02	1.90	1.80	1.89	1.88
25	1.70	1.72	1.79	2.29	1.94	2.18	2.05	2.52	1.88	1.90	1.80	1.85
26	1.70	1.74	1.80	2.15	1.95	2.30	2.05	2.67	1.86	1.89	1.80	1.83
27	1.69	1.76	1.92	2.28	2.65	4.75	2.19	2.82	1.84	1.85	1.79	1.81
28	1.68	1.76	1.82	2.60	2.60	3.12	2.28	2.74	1.85	1.81	1.76	1.80
29	1.70	1.72	1.92	2.45	.....	2.60	2.25	2.53	1.86	1.80	1.75	1.80
30	1.68	1.84	2.28	2.13	.....	2.50	2.23	2.42	1.85	1.78	2.05	1.96
31	1.70	.....	1.98	2.12	.....	2.30	.....	2.34	.....	1.75	1.95	.....

NOTE.—Observer reported ice floating in river Jan. 3, 1913. Discharge relation probably not materially affected by ice during the year ending Sept. 30, 1913.

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DOE RIVER AT VALLEY FORGE, TENN.

Location.—At Eastern Tennessee & Western North Carolina Railroad bridge at Valley Forge, about 4 miles above the mouth of the river.

Records available.—December 11, 1911, to September 30, 1913.

Drainage area.—132 square miles.

Gage.—Standard chain gage attached to bridge; read daily, morning and evening, to hundredths. Limits of use: Hundredths below 3.5, half-tenths from 3.5 to 5.0, and tenths above 5.0 feet.

Control.—Practically permanent.

Discharge measurements.—Made from upstream side of bridge or by wading at a section about 40 feet above the bridge. The current makes a decided angle with the bridge.

Point of zero flow.—A determination by leveling September 9, 1912, indicated that there would be no flow past the gage if the river were to fall to a stage of about −0.1 foot.

Winter flow.—Ice may affect the discharge relation for short periods, but only during unusually severe winters.

Accuracy.—Data insufficient for estimates of discharge.

No discharge measurements were made at this station during the year ending September 30, 1913.

Daily gage height, in feet, of Doe River at Valley Forge, Tenn., for the year ending Sept. 30, 1913.

[W. C. Garrison, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.22	1.10	1.20	1.45	1.60	2.22	2.00	1.90	2.00	1.25	1.12	1.25
2	1.20	1.20	1.34	1.50	1.60	2.00	1.90	1.78	1.98	1.30	1.95	1.18
3	1.16	1.12	1.35	1.45	1.65	1.80	1.82	1.70	1.78	1.82	1.40	1.18
4	1.16	1.10	1.31	1.25	1.80	1.75	1.75	1.62	1.92	1.40	1.20	1.28
5	1.14	1.10	1.34	1.50	1.65	1.72	1.70	1.60	1.75	1.38	1.10	1.28
6	1.14	1.10	1.36	1.60	1.65	1.65	1.65	1.58	1.78	1.30	1.22	1.25
7	1.12	1.94	1.32	1.55	1.50	1.50	1.62	1.62	1.70	1.25	1.30	1.22
8	1.10	1.70	1.26	1.50	1.50	1.55	1.62	1.55	2.32	1.20	2.10	1.18
9	1.10	1.42	1.20	1.50	1.40	1.52	1.62	1.55	2.10	1.20	1.60	1.20
10	1.10	1.32	1.19	1.45	1.50	1.65	1.58	1.50	1.95	1.20	1.45	1.18
11	1.10	1.26	1.22	1.45	1.60	1.72	1.58	1.48	1.80	1.30	1.32	1.12
12	1.08	1.21	1.20	1.50	1.90	1.70	2.00	1.42	1.75	1.38	1.28	1.12
13	1.10	1.19	1.06	1.60	1.35	1.70	2.05	.....	1.65	1.28	1.22	1.10
14	1.24	1.35	1.15	1.50	1.40	5.5	2.08	.....	1.60	1.20	1.40	1.10
15	1.28	1.24	1.21	1.50	1.25	4.6	2.02	.....	1.55	1.20	1.25	1.10
16	1.15	1.20	1.21	1.48	1.45	3.30	2.15	.....	1.38	1.18	1.30	1.25
17	1.12	1.14	1.16	1.45	1.55	2.45	2.10	1.68	1.35	1.35	1.20	1.30
18	1.12	1.18	1.22	1.42	1.52	2.20	1.95	1.68	1.40	1.30	1.20	1.25
19	1.20	1.18	1.19	1.62	1.48	2.02	1.85	1.55	1.45	1.20	1.20	1.30
20	1.18	1.18	1.04	1.55	1.50	1.95	1.85	1.55	1.42	1.20	1.25	1.28
21	1.11	1.16	1.12	1.65	1.60	1.88	1.78	1.52	1.40	1.20	1.20	2.00
22	1.11	1.15	1.10	1.75	1.55	2.05	1.65	1.55	1.38	1.15	1.18	1.60
23	1.20	1.15	1.10	1.65	1.55	1.95	1.60	2.10	1.35	1.10	1.42	1.30
24	1.18	1.15	1.19	1.70	1.48	1.85	1.58	3.40	1.42	1.10	1.30	1.30
25	1.10	1.14	.95	2.20	1.48	1.80	1.55	2.50	1.32	1.25	1.20	1.25
26	1.10	1.10	1.15	2.00	1.45	1.75	1.52	2.15	1.30	1.35	1.18	1.25
27	1.09	1.06	1.30	2.30	2.00	5.5	1.55	3.10	1.30	1.30	1.15	1.20
28	1.10	1.11	1.10	2.70	2.62	3.30	1.80	3.10	1.28	1.20	1.15	1.20
29	1.10	1.22	1.25	2.35	.....	2.30	1.95	2.60	1.28	1.25	1.10	1.30
30	1.10	1.19	1.60	1.98	.....	2.30	1.98	2.30	1.25	1.22	2.20	1.65
31	1.10	.....	1.52	1.80	.....	2.20	.....	2.08	.....	1.15	1.30	.....

NOTE.—Observer made no notes concerning ice. Discharge relation probably not affected by ice during the year ending Sept. 30, 1913.

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LITTLE TENNESSEE RIVER AT McGHEE, TENN.

Location.—At Louisville & Nashville Railroad bridge one-third mile south of McGhee and half a mile below the mouth of Tellico River.

Records available.—November 29, 1904, to September 30, 1913.

Drainage area.—2,470 square miles.

Gage.—Chain gage on crossties, upstream side of the railroad bridge, owned by United States Weather Bureau; read once daily to tenths. Prior to December 1, 1905, the same gage was on the old railroad bridge 1,000 feet below. The present datum is 0.3 foot higher than the original datum, allowing for slope in river measured at gage height 4 feet.

Control.—Practically permanent.

Discharge measurements.—Made from the downstream side of the railroad bridge.

Floods.—The flood of February 22, 1906, reached a height of 22.2 feet by the gage datum. The United States Weather Bureau reports a height of 39 feet March, 1867, and 38.5 feet in 1884.

Point of zero flow.—Report of the United States Engineers shows the controlling ledge below the gage to be about 2.5 feet lower than low water at the gage. The assumption that their low water is the same as lowest records places the point of zero flow at about −0.3 foot by gage datum.

Winter flow.—Ice does not affect the discharge relation.

Accuracy.—No discharge measurements have been made at this station since November 3, 1911, and the accuracy of estimates of discharge depends, therefore, on the permanency of the gage and of the discharge relation since that date.

Cooperation.—Gage-height records furnished by the United States Weather Bureau.

Daily gage height, in feet, of Little Tennessee River at McGhee, Tenn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3.1	2.7	2.6	4.3	6.0	8.1	7.8	4.1	4.6	2.8	3.0	2.6
2	3.1	2.9	2.6	4.1	5.2	6.4	6.9	4.0	4.6	3.2	3.4	2.4
3	3.0	3.2	3.1	4.5	5.0	5.6	6.4	3.9	4.2	3.4	3.6	2.4
4	3.0	2.8	3.7	4.4	5.9	5.3	6.0	3.9	4.1	3.4	3.4	2.4
5	2.9	2.7	4.2	4.2	5.4	5.0	5.9	3.8	4.0	3.2	3.0	2.2
6	2.9	2.7	6.8	4.2	5.1	4.8	5.6	3.8	4.0	3.2	2.8	2.6
7	2.9	3.1	5.6	4.7	4.8	4.6	5.3	3.7	4.0	3.2	3.2	2.8
8	2.8	4.3	4.4	4.7	4.6	4.4	5.2	3.9	4.2	3.0	3.0	2.6
9	2.8	3.7	3.9	4.5	4.4	4.3	5.1	4.0	4.5	2.8	3.0	2.4
10	2.8	3.2	3.5	4.5	4.3	4.5	4.9	3.9	4.9	2.8	3.4	2.4
11	2.8	3.0	3.5	4.2	4.5	6.4	4.8	3.8	4.3	2.8	3.0	2.6
12	2.7	3.0	3.4	4.5	10.3	5.8	5.9	3.7	4.0	3.4	3.0	2.4
13	3.1	2.9	3.4	5.5	7.2	5.2	5.6	3.6	3.8	4.4	2.8	2.2
14	3.3	2.9	3.3	5.1	5.8	15.1	5.1	3.6	3.7	3.4	2.8	2.2
15	3.5	2.9	3.2	5.0	5.3	17.5	5.2	3.5	3.6	3.0	3.2	2.4
16	3.3	2.9	3.2	4.4	4.9	12.9	5.6	3.6	3.5	2.8	3.0	2.6
17	3.1	2.8	3.1	4.1	4.7	9.6	5.1	3.9	3.5	2.8	3.0	2.4
18	2.8	2.8	3.2	5.1	4.4	7.9	5.1	4.0	3.4	2.8	2.8	3.0
19	2.8	2.8	3.4	5.5	4.2	7.1	4.9	3.8	3.5	2.8	2.6	2.8
20	3.9	2.8	3.3	4.7	4.2	6.5	4.9	3.7	3.8	2.6	2.6	2.6
21	3.4	2.8	3.1	4.5	4.7	6.7	4.8	3.6	3.6	2.6	3.0	2.8
22	3.2	2.7	3.0	5.3	4.6	8.7	4.5	3.5	3.4	2.6	3.2	3.0
23	3.0	2.7	3.0	4.7	4.4	6.7	4.4	4.6	3.5	2.6	3.0	3.0
24	3.0	2.7	3.9	5.0	4.3	6.1	4.3	13.5	3.5	2.6	2.8	2.8
25	2.9	2.7	3.6	10.1	4.1	5.8	4.3	7.4	3.4	3.2	2.8	2.6
26	2.9	2.7	3.4	7.1	4.0	5.8	4.2	5.6	3.4	3.0	2.6	2.4
27	2.8	2.6	3.3	6.7	5.7	13.7	4.4	5.0	3.3	3.2	2.4	2.4
28	2.8	2.6	3.7	10.4	15.1	17.4	4.3	5.8	3.3	3.4	2.4	2.4
29	2.7	2.6	3.4	7.2	.....	11.1	4.2	5.2	3.2	3.4	2.4	2.4
30	2.7	2.6	3.6	6.0	.....	9.1	4.2	5.0	3.1	3.0	2.6	2.6
31	2.7	.....	6.5	5.6	.....	8.5	.....	4.6	.....	3.0	2.8	.....

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Daily discharge, in second-feet, of Little Tennessee River at McGhee, Tenn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3,200	2,420	2,250	6,220	11,200	17,800	16,900	5,680	7,060	2,600	2,990	2,250
2	3,200	2,790	2,250	5,680	8,820	12,500	14,000	5,410	7,060	3,420	3,890	1,940
3	2,990	3,420	3,200	6,780	8,220	10,000	12,500	5,150	5,950	3,890	4,380	1,940
4	2,990	2,600	4,630	6,500	10,900	9,120	11,200	5,150	5,680	3,890	3,890	1,940
5	2,790	2,420	5,950	5,950	9,420	8,220	10,900	4,890	5,410	3,420	2,990	1,650
6	2,790	2,420	13,700	5,950	8,520	7,640	10,000	4,890	5,410	3,420	2,600	2,250
7	2,790	3,200	10,000	7,350	7,640	7,060	9,120	4,630	5,410	3,420	3,420	2,600
8	2,600	6,220	6,500	7,350	7,060	6,500	8,820	5,150	5,950	2,990	2,990	2,250
9	2,600	4,630	5,150	6,780	6,500	6,220	8,520	5,410	6,780	2,600	2,990	1,940
10	2,600	3,420	4,130	6,780	6,220	6,780	7,930	5,150	7,930	2,600	3,890	1,940
11	2,600	2,990	4,130	5,950	6,780	12,500	7,640	4,890	6,220	2,600	2,990	2,250
12	2,420	2,990	3,890	6,780	25,300	10,600	10,900	4,630	5,410	3,890	2,990	1,940
13	3,200	2,790	3,890	9,720	15,000	8,820	10,000	4,380	4,890	6,500	2,600	1,650
14	3,650	2,790	3,650	8,520	10,600	43,000	8,520	4,380	4,630	3,890	2,600	1,650
15	4,130	2,790	3,420	8,220	9,120	52,100	8,820	4,130	4,380	2,990	3,420	1,940
16	3,650	2,790	3,420	6,500	7,930	34,600	10,000	4,380	4,130	2,600	2,990	2,250
17	3,200	2,600	3,200	5,680	7,350	22,900	8,520	5,150	4,130	2,600	2,990	1,940
18	2,600	2,600	3,420	8,520	6,500	17,200	8,520	5,410	3,890	2,600	2,600	2,990
19	2,600	2,600	3,890	9,720	5,950	14,600	7,930	4,890	4,130	2,600	2,250	2,600
20	5,150	2,600	3,650	7,350	5,950	12,800	7,930	4,630	4,890	2,250	2,250	2,250
21	3,890	2,600	3,200	6,780	7,350	13,400	7,640	4,380	4,380	2,250	2,990	2,600
22	3,420	2,420	2,990	9,120	7,060	19,800	6,780	4,130	3,890	2,250	3,420	2,990
23	2,990	2,420	2,990	7,350	6,500	13,400	6,500	7,060	4,130	2,250	2,990	2,990
24	2,990	2,420	5,150	8,220	6,220	11,500	6,220	36,900	4,130	2,250	2,600	2,600
25	2,790	2,420	4,380	24,600	5,680	10,600	6,220	15,600	3,890	3,420	2,600	2,250
26	2,790	2,420	3,890	14,600	5,410	10,600	5,950	10,000	3,890	2,990	2,250	1,940
27	2,600	2,250	3,650	13,400	10,300	37,700	6,500	8,220	3,650	3,420	1,940	1,940
28	2,600	2,250	4,630	25,600	43,000	51,700	6,220	10,600	3,650	3,890	1,940	1,940
29	2,420	2,250	3,890	15,000	.....	28,100	5,950	8,820	3,420	3,890	1,940	1,940
30	2,420	2,250	4,380	11,200	.....	21,200	5,950	8,220	3,200	2,990	2,250	2,250
31	2,420	.....	12,800	10,000	.....	19,200	.....	7,060	.....	2,990	2,600	.....

NOTE.—Daily discharge computed from a rating curve fairly well defined between 1,390 and 1,650 second-feet (gage heights, 2 and 2.2 feet), well defined between 1,790 and 8,820 second-feet (gage heights, 2.3 and 5.2 feet), and fairly well defined between 9,120 and 24,200 second-feet (gage heights, 5.3 and 10 feet). Above gage height 13 feet the rating curve is extended as a tangent, the difference being 380 per tenth. See "Accuracy" in station description.

Monthly discharge of Little Tennessee River at McGhee, Tenn., for the year ending Sept. 30, 1913.

[Drainage area, 2,470 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	5,150	2,420	3,000	1.21	1.40	A.
November	6,220	2,250	2,830	1.15	1.28	A.
December	13,700	2,250	4,720	1.91	2.20	A.
January	25,600	5,680	9,300	3.77	4.35	B.
February	43,000	5,410	9,880	4.00	4.16	C.
March	52,100	6,220	18,000	7.29	8.40	C.
April	16,900	5,950	8,750	3.54	3.95	B.
May	36,900	4,130	7,080	2.87	3.31	B.
June	7,930	3,200	4,920	1.99	2.22	B.
July	6,500	2,250	3,140	1.27	1.46	B.
August	4,380	1,940	2,880	1.17	1.35	B.
September	2,990	1,650	2,190	.887	.99	B.
The year	52,100	1,650	6,380	2.58	35.07	

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TUCKASEGEE RIVER AT BRYSON, N. C.

Location.—At highway bridge in the town of Bryson, half a mile below the mouth of Deep Creek and about 15 miles above the junction of Tuckasegee River with Little Tennessee River.

Records available.—November 7, 1897, to September 30, 1913.

Drainage area.—662 square miles.

Gage.—Vertical staff attached to the right bank bridge pier; read daily, morning and evening, to half tenths. Limits of use: Hundredths below 1.5, half-tenths from 1.5 to 2.5, and tenths above 2.5 feet.

Control.—Bowlders. Probably changes slightly after each flood, but change appears to be temporary as conditions quickly return to normal.

Discharge measurements.—Made from the downstream side of the bridge.

Floods.—The flood of March 19, 1899, reached a height of 11.0 feet.

Winter flow.—Discharge relation not affected by ice.

Accuracy.—Excellent for low and ordinary stages; discharge rating curves not so well defined for high stages, as they depend on one discharge measurement made in 1901.

No discharge measurements were made at this station during the year ending September 30, 1913.

Daily gage height, in feet, of Tuckasegee River at Bryson, N. C., for the year ending Sept. 30, 1913.

[J. M. Welch, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.48	1.30	1.20	1.8	2.4	2.8	3.1	1.9	2.0	1.5	1.7	1.22
2	1.40	1.30	1.40	1.7	2.15	2.5	2.9	1.85	1.9	1.45	1.8	1.20
3	1.40	1.25	1.5	1.75	2.6	2.3	2.8	1.8	1.9	1.6	1.6	1.18
4	1.40	1.28	1.65	1.6	2.6	2.1	2.7	1.8	1.9	1.8	1.45	1.18
5	1.45	1.30	2.4	1.6	2.3	2.1	2.6	1.75	2.0	1.55	1.40	1.35
6	1.35	1.6	2.8	1.65	2.2	2.1	2.5	1.7	1.9	1.45	1.7	1.40
7	1.32	1.85	2.0	1.8	2.1	2.0	2.5	1.75	1.85	1.40	1.45	1.30
8	1.30	1.8	1.7	1.8	2.0	1.9	2.35	1.8	2.4	1.35	1.42	1.25
9	1.30	1.55	1.6	1.8	1.9	1.9	2.3	1.9	2.2	1.35	1.75	1.25
10	1.30	1.40	1.5	1.7	1.9	2.3	2.25	1.8	2.05	1.30	1.5	1.22
11	1.30	1.35	1.5	1.65	2.6	2.3	2.7	1.7	1.9	1.38	1.65	1.12
12	1.25	1.30	1.45	2.8	3.0	2.2	3.1	1.7	1.8	2.0	1.5	1.15
13	1.25	1.30	1.45	2.2	2.35	2.3	2.5	1.65	1.8	1.65	1.40	1.15
14	1.5	1.30	1.38	1.95	2.2	7.0	2.4	1.65	1.7	1.48	1.8	1.30
15	1.55	1.30	1.35	1.8	2.1	5.9	2.45	1.65	1.7	1.40	1.55	1.30
16	1.35	1.25	1.35	1.75	2.0	4.2	2.45	1.7	1.6	1.40	1.45	1.40
17	1.30	1.25	1.35	1.7	2.0	3.5	2.4	1.8	1.6	1.38	1.42	1.6
18	1.30	1.25	1.5	2.25	1.45	3.1	2.4	1.7	1.6	1.40	1.30	1.48
19	1.7	1.25	1.45	1.95	1.85	2.8	2.4	1.65	1.8	1.40	1.30	1.42
20	1.6	1.25	1.35	1.8	2.0	2.8	2.3	1.65	1.6	1.30	1.6	1.32
21	1.40	1.25	1.35	1.9	2.2	3.2	2.2	1.6	1.6	1.25	1.5	2.0
22	1.35	1.25	1.35	1.8	2.0	3.0	2.1	1.6	1.7	1.28	1.6	1.55
23	1.35	1.25	1.40	1.8	1.9	2.8	2.05	3.9	1.6	1.35	1.5	1.40
24	1.32	1.25	1.40	2.15	1.9	2.6	2.0	3.6	1.6	1.25	1.42	1.30
25	1.30	1.20	1.45	2.9	1.8	2.6	2.0	2.6	1.6	1.40	1.30	1.30
26	1.30	1.20	1 38	2.4	2.9	3.5	1.95	2.25	1.6	1.6	1.25	1.25
27	1.28	1.20	1.5	3.6	5.6	9.3	2.0	2.3	1.5	1.8	1.25	1.20
28	1.30	1.22	1.42	3.2	3.4	5.0	2.0	2.8	1.5	1.75	1.20	1.20
29	1.30	1.15	1.40	2.7	.....	4.2	1.9	2.3	1.55	1.6	1.25	1.32
30	1.45	1.20	2.6	2.4	.....	3.8	1.95	2.15	1.55	1.5	1.55	1.55
31	1.32	.....	2.15	2.7	.....	3.4	.....	1.7	.....	1.55	1.28	.....

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Daily discharge, in second-feet, of Tuckasegee River at Bryson, N. C., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	906	700	600	1,350	2,340	3,090	3,690	1,500	1,660	930	1,200	620
2	810	700	810	1,200	1,900	2,520	3,290	1,420	1,500	870	1,350	600
3	810	650	930	1,280	2,710	2,160	3,090	1,350	1,500	1,060	1,060	580
4	810	680	1,130	1,060	2,710	1,820	2,900	1,350	1,500	1,350	870	580
5	870	700	2,340	1,060	2,160	1,820	2,710	1,280	1,660	995	810	755
6	755	1,060	3,090	1,130	1,990	1,820	2,520	1,200	1,500	870	1,200	810
7	722	1,420	1,660	1,350	1,820	1,660	2,520	1,280	1,420	810	870	700
8	700	1,350	1,200	1,350	1,660	1,500	2,250	1,350	2,340	755	834	650
9	700	995	1,060	1,350	1,500	1,500	2,160	1,500	1,990	755	1,280	650
10	700	810	930	1,200	1,500	2,160	2,080	1,350	1,740	700	930	620
11	700	755	930	1,130	2,710	2,160	2,900	1,200	1,500	788	1,130	520
12	650	700	870	3,090	3,490	1,990	3,690	1,200	1,350	1,660	930	550
13	650	700	870	1,990	2,250	2,160	2,520	1,130	1,350	1,130	810	550
14	930	700	788	1,580	1,990	19,000	2,340	1,130	1,200	906	1,350	700
15	995	700	755	1,350	1,820	12,600	2,430	1,130	1,200	810	995	700
16	755	650	755	1,280	1,660	6,350	2,430	1,200	1,060	810	870	810
17	700	650	755	1,200	1,660	4,560	2,340	1,350	1,060	788	834	1,060
18	700	650	930	2,080	870	3,690	2,340	1,200	1,060	810	700	906
19	1,200	650	870	1,580	1,420	3,090	2,340	1,130	1,350	810	700	834
20	1,060	650	755	1,350	1,660	3,090	2,160	1,130	1,060	700	1,060	722
21	810	650	755	1,500	1,990	3,900	1,990	1,060	1,060	650	930	1,060
22	755	650	755	1,350	1,660	3,490	1,820	1,060	1,200	680	1,060	995
23	755	650	810	1,350	1,500	3,090	1,740	5,540	1,060	755	930	810
24	722	650	810	1,900	1,500	2,710	1,660	4,800	1,060	650	834	700
25	700	600	870	3,290	1,350	2,710	1,660	2,710	1,060	810	700	700
26	700	600	788	2,340	3,290	4,560	1,580	2,080	1,060	1,060	650	650
27	680	600	930	4,800	11,100	32,300	1,660	2,160	930	1,350	650	600
28	700	620	834	3,900	4,330	8,800	1,660	3,090	930	1,280	600	600
29	700	550	810	2,900	.....	6,350	1,500	2,160	995	1,060	650	722
30	870	600	2,710	2,340	.....	5,290	1,580	1,900	995	930	995	995
31	722	.....	1,900	2,900	.....	4,330	.....	1,200	.....	995	680	.....

NOTE.—Daily discharge determined by means of a discharge rating curve that is well defined below 3,460 second-feet (gage height, 3.0 feet) and poorly defined above that point.

Monthly discharge of Tuckasegee River at Bryson, N. C., for the year ending Sept. 30, 1913.

[Drainage area, 662 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	1,200	650	782	1.18	1.36	A.
November	1,420	550	735	1.11	1.24	B.
December	3,090	600	1,100	1.66	1.91	B.
January	4,800	1,060	1,860	2.81	3.24	B.
February	11,100	870	2,380	3.60	3.75	C.
March	32,300	1,500	5,040	7.61	8.77	C.
April	3,690	1,500	2,320	3.50	3.90	A.
May	5,540	1,060	1,710	2.58	2.97	B.
June	2,340	930	1,310	1.98	2.21	A.
July	1,660	650	920	1.39	1.60	A.
August	1,350	600	918	1.39	1.60	A.
September	1,660	520	745	1.13	1.26	B.
The year	32,300	520	1,650	2.49	33.81	

HIWASSEE RIVER AT MURPHY, N. C.

Location.—At highway bridge near the Louisville & Nashville Railroad station half a mile above the mouth of Valley River.

Records available.—June 26, 1896, to August 8, 1897; October 19, 1897, to September 30, 1913.

Drainage area.—410 square miles.

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Gage.—Chain gage attached to downstream side of bridge; read once daily to half-tenths. Limits of use: Half-tenths below 7.0 and tenths above 7.0. Original wire-rope gage was near the same point on bridge. Datum unchanged since October 20, 1897. Record of datum of former gage lost when wire rope broke August 8, 1897.

Control.—Rock and gravel; less permanent than the channel at measuring section, at which the bottom is rough and rocky. Discharge relation also changed to some extent by rebuilding railroad bridge piers 80 feet downstream, but relation has been apparently constant since.

Discharge measurements.—Made from upstream side of bridge.

Floods.—The flood of March 19, 1899, reached a height of 18.4 feet.

Point of zero flow.—Approximately at gage height 4.4 feet.

Winter flow.—Not affected by ice.

Regulation.—The few small mill dams on the stream are so far upstream that diurnal fluctuation is practically nil.

Accuracy.—No discharge measurements were made at this station during the year ending September 30, 1913, but six measurements made in 1914 made it desirable to revise the rating curve. The new rating used, beginning January 1, 1913, probably applies to the years 1909–1912. The maximum difference between the two ratings is about 7 per cent and occurs at gage height 7.2 feet, discharge about 2,270 second-feet, the new curve giving the smaller discharge. Discharge data published for 1909–1912 should be revised, if considered necessary, by those using them. The maximum difference in the monthly means is about 6 per cent.

Daily gage height, in feet, of Hiwassee River at Murphy, N. C., for the year ending Sept. 30, 1913.

[Miss Willie Mingus, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	5.4	5.3	5.25	5.75	6.25	6.85	6.8	5.8	5.7	5.55	5.5	5.05
2	5.35	5.5	5.25	5.65	6.05	6.5	6.8	5.7	5.7	5.40	5.45	5.05
3	5.3	5.3	5.5	5.8	6.05	6.2	6.7	5.7	5.6	5.35	5.30	5.05
4	5.3	5.3	5.35	5.7	6.25	6.2	6.6	5.7	5.6	5.5	5.25	5.5
5	5.45	5.3	5.95	5.7	6.2	6.05	6.5	5.7	5.55	5.75	5.20	5.10
6	5.35	5.25	6.55	5.65	6.1	6.0	6.45	5.65	5.6	5.40	5.25	5.30
7	5.3	5.6	6.05	5.6	6.0	6.0	6.4	5.65	5.9	5.30	5.20	5.10
8	5.3	5.7	5.8	5.55	5.95	5.9	6.35	5.95	5.6	5.25	5.5	5.05
9	5.25	5.5	5.65	5.75	5.85	5.9	6.25	5.85	7.6	5.25	5.6	5.05
10	5.25	5.45	5.55	5.7	5.8	6.45	6.25	5.8	7.6	5.25	5.45	5.20
11	5.2	5.4	5.5	5.7	6.1	6.85	6.4	5.65	5.9	5.25	5.40	5.20
12	5.2	5.4	5.5	6.0	6.65	6.5	6.25	5.6	5.8	6.2	5.25	5.05
13	5.2	5.35	5.5	6.25	6.8	6.3	6.2	5.6	5.8	5.7	5.20	5.05
14	5.3	5.6	5.4	6.0	6.55	13.0	6.2	5.6	5.7	5.5	5.20	5.10
15	5.5	5.4	5.4	5.8	6.3	11.0	6.3	5.6	5.65	5.40	5.20	5.05
16	5.3	5.35	5.4	5.8	6.1	8.7	6.2	5.7	5.6	5.40	5.40	5.10
17	5.2	5.3	5.35	5.7	6.05	7.4	6.1	6.0	5.55	5.30	5.25	5.15
18	5.2	5.3	5.5	5.85	6.0	7.2	6.05	5.75	5.5	5.25	5.20	5.10
19	5.5	5.3	5.4	5.85	5.9	6.85	6.05	5.6	5.55	5.35	5.15	5.15
20	6.1	5.3	5.4	5.75	6.0	6.8	6.0	5.7	5.5	5.20	5.5	5.10
21	5.6	5.3	5.35	5.8	6.1	6.8	5.95	5.6	5.65	5.20	5.55	5.5
22	5.5	5.3	5.35	5.8	6.05	7.1	5.9	5.55	5.45	5.20	5.30	5.25
23	5.5	5.3	5.35	5.75	5.95	6.8	5.9	6.0	5.5	5.15	5.25	5.00
24	5.4	5.25	5.5	5.85	5.9	6.7	5.9	7.4	5.5	5.20	5.20	5.10
25	5.55	5.25	5.45	7.0	8.0	6.6	5.85	6.4	5.55	5.20	5.20	5.05
26	5.25	5.25	5.45	6.4	5.8	6.55	5.85	6.0	5.45	5.20	5.10	5.00
27	5.3	5.25	5.5	7.9	5.85	11.8	5.9	5.6	5.5	5.65	5.10	5.05
28	5.3	5.25	5.5	7.8	7.6	8.7	5.9	5.95	5.85	5.35	5.10	5.00
29	5.3	5.25	5.5	6.75	.....	7.7	5.85	5.8	5.4	5.30	5.10	5.05
30	5.25	5.25	5.55	6.35	.....	7.4	5.8	7.1	5.5	5.35	5.5	6.0
31	5.25	.....	5.85	6.35	.....	7.2	.....	5.7	.....	5.35	5.15	.....

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Daily discharge, in second-feet, of Hiwassee River at Murphy, N. C., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	475	405	370	730	1,160	1,810	1,750	770	690	570	530	232
2	440	550	370	650	975	1,420	1,750	690	690	455	492	232
3	405	405	550	770	975	1,110	1,640	690	610	420	385	232
4	405	405	440	690	1,160	1,110	1,530	690	610	530	352	530
5	512	405	930	690	1,110	975	1,420	690	570	730	320	200
6	440	370	1,550	650	1,020	930	1,360	650	610	455	352	385
7	405	630	1,020	610	930	930	1,310	650	850	385	320	260
8	405	710	795	570	890	850	1,260	890	610	352	530	232
9	370	550	670	730	810	850	1,160	810	2,930	352	610	232
10	370	512	590	690	770	1,360	1,160	770	2,930	352	492	320
11	335	475	550	690	1,020	1,810	1,310	650	850	352	455	320
12	335	475	550	930	1,580	1,420	1,160	610	770	1,110	352	232
13	335	440	550	1,160	1,750	1,210	1,110	610	770	690	320	232
14	405	630	475	930	1,480	15,400	1,110	610	690	530	320	260
15	550	475	475	770	1,210	10,400	1,210	610	650	455	320	232
16	405	440	475	770	1,020	5,120	1,110	690	610	455	455	260
17	335	405	440	690	975	2,580	1,020	930	570	385	352	290
18	335	405	550	810	930	2,270	975	730	530	352	320	260
19	550	405	475	810	850	1,810	975	610	570	420	290	290
20	1,070	405	475	730	930	1,750	930	690	530	320	530	260
21	630	405	440	770	1,020	1,750	890	610	650	320	570	530
22	550	405	440	770	975	2,130	850	570	492	320	385	352
23	550	405	440	730	890	1,750	850	930	530	290	352	205
24	475	370	550	810	850	1,640	850	2,580	530	320	320	260
25	590	370	512	2,000	3,700	1,530	810	1,310	570	320	320	232
26	370	370	512	1,310	770	1,480	810	930	492	320	260	205
27	405	370	550	3,500	810	12,400	850	610	530	650	260	232
28	405	370	550	3,310	2,930	5,120	850	890	810	420	260	205
29	405	370	550	1,700	.....	3,120	810	770	455	385	260	232
30	370	370	590	1,260	.....	2,580	770	2,130	530	420	530	930
31	370	.....	840	1,260	.....	2,270	.....	690	.....	420	290	.....

NOTE.—Daily discharge computed from a rating curve well defined below 3,700 second-feet (gage height, 8.0 feet). Above gage height 10.5 feet the rating curve is a tangent, the difference being 250 per tenth.

Monthly discharge of Hiwassee River at Murphy, N. C., for the year ending Sept. 30, 1913.

[Drainage area, 410 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	1,070	335	452	1.10	1.27	A.
November	710	370	443	1.08	1.20	A.
December	1,550	370	589	1.44	1.66	A.
January	3,500	570	1,050	2.56	2.95	A.
February	3,700	770	1,200	2.93	3.05	B.
March	15,400	850	2,930	7.15	8.24	B.
April	1,750	770	1,120	2.73	3.05	A.
May	2,580	570	841	2.05	2.36	B.
June	2,930	455	774	1.89	2.11	A.
July	1,110	290	447	1.09	1.26	A.
August	610	260	384	.937	1.08	A.
September	930	205	298	.727	.81	A.
The year	15,400	205	877	2.14	29.04	

NOTE.—See "Accuracy" under station description.

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HIWASSEE RIVER AT RELIANCE, TENN.

Location.—At Louisville & Nashville Railroad bridge at Reliance, Tenn., 1 mile below the mouth of Lost Creek and 2 miles above Spring Creek.

Records available.—August 17, 1900, to September 30, 1913.

Drainage area.—1,180 square miles.

Gage.—Vertical staff attached to a tree on right bank 150 feet above the bridge; read once daily to half-tenths. Limits of use: Half-tenths below 2.5, and tenths above 2.5 feet.

Control.—A rock ledge crosses the river diagonally. The lower end of the natural dam has been built up to some extent to pond the water for a small mill.

Discharge measurements.—Made from the upstream side of 5-span steel highway bridge 1,000 feet below gage.

Floods.—The flood of November 19, 1906, reached a height of 15.2 feet.

Winter flow.—Not affected by ice.

Regulation.—None above. The operation of a small mill below may affect the low-water flow.

Accuracy.—Estimates of discharge subsequent to March 26, 1913, not prepared for publication, as it is assumed that the change in the discharge relation indicated by the discharge measurement made May 15, 1913, was caused by the rise of March 27, and data are insufficient to determine a new discharge rating curve.

The following discharge measurement was made by W. E. Hall and B .M. Hall, jr.: May 15, 1913: Gage height, 1.65 feet; discharge, 1,770 second-feet.

Daily gage height, in feet, of Hiwassee River at Reliance, Tenn., for the year ending Sept. 30, 1913.

[C. V. Higdon, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.4	1.3	1.25	2.05	2.8	3.7	3.8	2.0	1.8	1.6	1.4	1.0
2	1.4	1.3	1.25	2.4	2.4	2.9	2.9	1.85	1.85	1.45	1.5	1.0
3	1.65	1.4	1.35	1.95	2.4	2.6	2.9	1.8	1.8	1.4	1.6	.95
4	1.65	1.35	1.5	2.25	2.5	2.6	2.8	1.85	1.75	1.4	1.5	.95
5	1.7	1.3	1.55	2.0	2.5	2.5	2.7	1.75	1.65	1.75	1.3	1.0
6	1.4	1.35	2.7	1.9	2.4	2.3	2.5	1.75	1.75	1.6	1.2	1.0
7	1.25	1.45	2.4	1.85	2.25	2.3	2.6	1.9	1.75	1.5	1.3	1.0
8	1.3	2.2	2.0	1.9	2.15	2.1	2.5	1.9	2.5	1.4	1.35	1.0
9	1.2	1.7	1.8	2.05	2.05	2.1	2.4	1.9	2.6	1.2	1.35	1.0
10	1.25	1.45	1.7	1.95	2.15	2.25	2.45	1.95	3.0	1.2	1.65	.95
11	1.25	1.45	1.6	1.9	2.15	2.0	2.4	1.9	2.25	1.35	1.5	1.2
12	1.2	1.45	1.55	1.8	4.8	2.7	2.4	1.7	2.0	1.5	1.35	1.0
13	1.2	1.4	1.5	2.7	3.4	3.0	2.35	1.75	1.9	2.0	1.2	.95
14	1.25	1.4	1.4	2.4	2.9	8.6	2.5	1.75	1.3	1.5	1.2	.95
15	1.7	1.4	1.4	2.15	2.45	7.9	2.5	1.65	1.25	1.35	1.2	.95
16	1.5	1.35	1.4	2.0	2.45	5.8	2.5	1.7	1.2	1.3	1.2	1.0
17	1.3	1.35	1.4	1.95	2.35	4.6	2.4	1.85	1.6	1.3	1.5	1.0
18	1.3	1.35	1.55	2.2	2.2	4.1	2.2	2.0	1.6	1.25	1.2	1.0
19	1.5	1.35	1.65	2.1	2.2	3.1	2.1	1.75	1.7	1.15	1.15	1.05
20	3.2	1.3	1.6	2.4	2.2	3.2	2.2	1.7	1.6	1.15	1.1	1.05
21	1.9	1.3	1.5	2.6	2.6	3.1	2.2	1.7	1.55	1.1	1.3	1.2
22	1.65	1.3	1.4	2.2	2.35	3.7	2.05	1.7	1.65	1.1	1.35	1.7
23	1.45	1.3	1.4	2.05	2.3	3.1	2.05	3.3	1.65	1.0	1.2	1.25
24	1.5	1.25	1.6	2.6	2.2	3.0	2.1	4.8	1.6	1.1	1.2	1.1
25	1.45	1.3	1.75	4.2	2.15	2.7	1.95	2.8	1.45	1.2	1.15	1.0
26	1.4	1.3	1.6	3.0	2.05	2.7	2.0	2.8	1.45	1.25	1.05	.95
27	1.35	1.3	1.6	3.5	4.5	8.6	2.1	2.15	1.45	1.35	1.0	.95
28	1.3	1.25	1.7	4.2	5.6	6.8	2.05	2.15	1.45	2.2	1.05	.95
29	1.3	1.25	1.6	3.2	.....	4.2	2.0	2.0	1.45	1.7	1.05	1.0
30	1.3	1.25	1.8	3.2	.....	3.8	2.0	1.9	1.4	1.35	1.05	1.2
31	1.3	.....	2.2	2.7	.....	3.8	.....	1.85	.....	1.3	1.0	.....

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Daily discharge, in second-feet, of Hiwassee River at Reliance, Tenn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.
1	1,180	1,040	975	2,370	4,300	7,300	16	1,330	1,110	1,180	2,260	3,330	15,800
2	1,180	1,040	975	3,200	3,200	4,600	17	1,040	1,110	1,180	2,160	3,080	10,700
3	1,580	1,180	1,110	2,160	3,200	3,730	18	1,040	1,110	1,410	2,710	2,710	8,780
4	1,580	1,110	1,330	2,830	3,460	3,730	19	1,330	1,110	1,580	2,480	2,710	5,230
5	1,660	1,040	1,410	2,260	3,460	3,460	20	5,560	1,040	1,490	3,200	2,710	5,560
6	1,180	1,110	4,010	2,050	3,200	2,950	21	2,050	1,040	1,330	3,730	3,730	5,230
7	975	1,260	3,200	1,950	2,830	2,950	22	1,580	1,040	1,180	2,710	3,080	7,300
8	1,040	2,710	2,260	2,050	2,600	2,480	23	1,260	1,040	1,180	2,370	2,950	5,230
9	910	1,660	1,850	2,370	2,370	2,480	24	1,330	975	1,490	3,730	2,710	4,910
10	975	1,260	1,660	2,160	2,600	2,830	25	1,260	1,040	1,760	9,160	2,600	4,010
11	975	1,260	1,490	2,050	2,600	2,260	26	1,180	1,040	1,490	4,910	2,370	4,010
12	910	1,260	1,410	1,850	11,600	4,010	27	1,110	1,040	1,490	6,590	10,300	.....
13	910	1,180	1,330	4,010	6,240	4,910	28	1,040	975	1,660	9,160	15,000	.....
14	975	1,180	1,180	3,200	4,600	28,400	29	1,040	975	1,490	5,560	.....	.....
15	1,660	1,180	1,180	2,600	3,330	25,200	30	1,040	975	1,850	5,560	.....	.....
							31	1,040	.....	2,710	4,010	.....	.....

Monthly discharge of Hiwassee River at Reliance, Tenn., for the year ending Sept. 30, 1913.

[Drainage area, 1,180 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	5,560	910	1,350	1.14	1.31	A.
November	2,710	975	1,170	.992	1.11	A.
December	4,010	975	1,610	1.36	1.57	A.
January	9,160	1,850	3,460	2.93	3.38	A.
February	15,000	2,370	4,170	3.53	3.68	B.

NOTE.—See "Accuracy" in station description.

OCOEE RIVER AT COPPER HILL, TENN.

Location.—At highway bridge in town of Copper Hill, Tenn., half a mile above the mouth of Fightingtown Creek.

Records available.—March 21, 1903, to September 30, 1913.

Drainage area.—374 square miles.

Gage.—Chain gage attached to upstream side of bridge, installed August 2, 1911; read daily, morning and evening, to half-tenths. Limits of use: Hundredths below 0.5, half-tenths from 0.5 to 1.5, and tenths above 1.5 feet. See Water-Supply Paper 323 for history of gage.

Control.—Practically permanent.

Discharge measurements.—Made from the downstream side of bridge.

Floods.—The flood of November 19, 1906, reached a height of 18.5 feet.

Winter flow.—Ice does not affect the discharge relation.

Regulation.—As there are only a few small water powers operating above, the diurnal fluctuation is noticeable only during extremely low stages.

Accuracy.—A new discharge rating curve was used for the year ending September 30, 1913 (also for 1912), which differs from the previous curves principally above 1,200 second-feet, the new curve giving the larger discharge for a given gage height above that point. The change in rating is based chiefly on four discharge measurements made in 1913, and the new curve is well defined between 350 and

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3,100 second-feet (gage heights 0.7 and 4.4 feet) and fairly well defined between 3,200 and 8,700 second-feet (gage heights 4.5 and 8.0 feet). The highest discharge measurement prior to 1913 was at gage height 3.4 feet, whereas two of the 1913 measurements are at a stage of about 7.5 feet. Errors in estimates of discharge published prior to 1912, due to what now appears to have been erroneous extensions of the discharge rating curves used, are less than 10 per cent below discharge 3,000 second-feet, but above that point the discharge computations should be revised by those using them on the basis of a rating table derived (as explained on p. 14) from the data published below. The data for 1911, published in Water-Supply Paper 303, are within the accuracy ratings assigned, but the new rating curve should probably have been used beginning about October 17, 1911.

Discharge measurements of Ocoee River at Copper Hill, Tenn., in the year ending Sept. 30, 1913.

[Hydrographer, W. E. Hall.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Feb. 27	7.54	7,960	Feb. 28	4.08	2,800
Do	7.40	7,340	Do	3.77	2,530

Daily gage height, in feet, of Ocoee River at Copper Hill, Tenn., for the year ending Sept. 30, 1913.

[W. R. Ledford, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.1	1.2	0.85	1.4	2.2	3.0	3.2	1.8	1.7	1.25	1.35	0.55
2	1.0	1.05	.9	1.3	1.9	2.4	3.2	1.8	1.8	1.1	1.5	.55
3	.95	1.0	.85	2.2	2.1	2.4	3.1	1.7	1.7	1.1	1.0	.55
4	1.4	.95	.85	1.6	2.4	2.4	3.0	1.7	1.6	1.1	.9	.55
5	1.2	.95	1.3	1.45	2.1	2.2	3.0	1.6	1.8	1.1	.8	.6
6	1.1	1.0	2.4	1.4	2.0	2.0	2.8	1.6	1.7	1.1	.8	.6
7	1.1	1.8	1.6	1.4	1.9	2.1	2.7	1.8	1.6	1.0	.8	.55
8	1.0	1.6	1.4	1.6	1.8	2.0	2.6	2.0	1.8	.9	1.75	.55
9	.9	1.3	1.3	1.6	1.8	2.0	2.6	1.9	2.6	.9	1.8	.55
10	.9	1.2	1.25	1.4	1.9	3.2	2.6	1.8	1.9	.9	1.0	.55
11	.95	1.1	1.2	1.45	3.0	3.0	2.6	1.7	1.6	1.4	.8	.55
12	.95	1.1	1.2	2.2	3.3	2.5	2.6	1.6	1.5	2.0	.9	.5
13	.9	1.25	1.1	2.0	2.5	2.8	2.6	1.6	1.45	1.5	.8	.5
14	1.4	1.3	1.1	1.7	2.2	8.0	2.6	1.6	1.4	.6	.8	.5
15	1.25	1.2	1.1	1.6	2.0	6.2	2.6	1.5	1.4	.1	.8	.6
16	1.1	1.1	1.05	1.6	1.9	4.8	2.4	1.5	1.35	.1	.8	.65
17	1.0	1.0	1.05	1.6	1.8	3.8	2.2	2.1	1.25	.5	.8	.55
18	.95	.9	1.1	1.8	1.8	3.5	2.2	1.6	1.25	.85	.8	.6
19	2.6	.9	1.2	1.8	1.8	3.2	2.1	1.5	1.2	.8	.8	.6
20	1.9	.9	1.1	1.7	2.4	3.4	2.1	1.7	1.1	.7	1.2	.6
21	1.5	.9	1.05	1.7	2.2	3.7	2.0	1.5	1.15	.7	.9	.6
22	1.4	.9	1.05	1.8	2.1	3.3	2.0	2.2	1.2	.7	.8	.6
23	1.2	.9	1.3	1.6	2.0	3.1	1.9	5.2	1.2	.75	.8	.55
24	1.1	.9	1.6	1.6	1.9	3.0	1.8	3.5	1.15	.75	.75	.5
25	1.0	.9	1.3	2.4	1.9	2.9	1.8	2.8	1.1	.9	.7	.5
26	1.0	.9	1.2	2.8	1.9	3.5	1.9	2.0	1.1	.9	.65	.5
27	1.0	.9	1.3	2.6	6.4	7.4	2.0	1.9	1.2	1.3	.65	.5
28	.95	.9	1.2	3.7	3.8	4.5	2.0	1.8	1.2	1.25	.6	.5
29	.95	.9	1.2	3.0	.....	4.2	1.9	1.7	1.3	1.1	.6	1.6
30	.95	.85	1.5	2.4	.....	3.8	1.8	1.6	1.6	.9	.6	1.7
31	.95	.....	1.7	2.6	.....	3.4	.....	1.6	.....	.9	.6	.....

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Daily discharge, in second-feet, of Ocoee River at Copper Hill, Tenn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	545	600	415	720	1,260	1,880	2,050	975	910	630	690	290
2	490	518	440	660	1,040	1,400	2,050	975	975	545	780	290
3	465	490	415	1,260	1,180	1,400	1,960	910	910	545	490	290
4	720	465	415	845	1,400	1,400	1,880	910	845	545	440	290
5	600	465	660	750	1,180	1,260	1,880	845	975	545	390	310
6	545	490	1,400	720	1,110	1,110	1,720	845	910	545	390	310
7	545	975	845	720	1,040	1,180	1,640	975	845	490	390	290
8	490	845	720	845	975	1,110	1,560	1,110	975	440	942	290
9	440	660	660	845	975	1,110	1,560	1,040	1,560	440	975	290
10	440	600	630	720	1,040	2,050	1,560	975	1,040	440	490	290
1	465	545	600	750	1,880	1,880	1,560	910	845	720	390	290
12	465	545	600	1,260	2,140	1,480	1,560	845	780	1,110	440	270
13	440	630	545	1,110	1,480	1,720	1,560	845	750	780	390	270
14	720	660	545	910	1,260	8,700	1,560	845	720	310	390	270
15	630	600	545	845	1,110	5,390	1,560	780	720	130	390	310
16	545	545	518	845	1,040	3,510	1,400	780	690	130	390	330
17	490	490	518	845	975	2,560	1,260	1,180	630	270	390	290
18	465	440	545	975	975	2,300	1,260	845	630	415	390	310
19	1,560	440	600	975	975	2,050	1,180	780	600	390	390	310
20	1,040	440	545	910	1,400	2,220	1,180	910	545	350	600	310
21	780	440	518	910	1,260	2,480	1,110	780	572	350	440	310
22	720	440	518	975	1,180	2,140	1,110	1,260	600	350	390	310
23	600	440	660	845	1,110	1,960	1,040	3,970	600	370	390	290
24	545	440	845	845	1,040	1,880	975	2,300	572	370	370	270
25	490	440	660	1,400	1,040	1,800	975	1,720	545	440	350	270
26	490	440	660	1,720	1,040	2,300	1,040	1,110	545	440	330	270
27	490	440	660	1,560	5,710	7,520	1,110	1,040	600	660	330	270
28	465	440	600	2,480	2,560	3,200	1,110	975	600	630	310	270
29	465	440	600	1,880	.....	2,910	1,040	910	660	545	310	845
30	465	415	780	1,400	.....	2,560	975	845	845	440	310	910
31	465	.....	910	1,560	.....	2,220	.....	845	.....	440	310	.....

NOTE.—Daily discharge computed from a rating curve well defined between 350 and 3,100 second-feet (gage heights 0.7 and 4.4 feet), and fairly well defined between 3,200 and 8,700 second-feet (gage heights 4.5 and 8.0 feet). It should be observed that no discharge measurements were made at the station subsequent to the high water during March, and that the accuracy of the estimates of discharge thereafter depends on the permanency of the gage and of the discharge relation.

Monthly discharge of Ocoee River at Copper Hill, Tenn., for the year ending Sept. 30, 1913.

[Drainage area, 374 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	1,560	440	583	1.56	1.80	A.
November	975	415	527	1.41	1.57	B.
December	1,400	415	629	1.68	1.94	A.
January	2,480	660	1,070	2.86	3.30	A.
February	5,710	975	1,410	3.77	3.93	A.
March	8,700	1,110	2,470	6.60	7.61	B.
April	2,050	975	1,410	3.77	4.21	A.
May	3,970	780	1,100	2.94	3.39	A.
June	1,560	545	766	2.05	2.29	A.
July	1,110	130	478	1.28	1.48	B.
August	975	310	451	1.21	1.40	B.
September	910	270	330	.882	.98	B.
The year	8,700	130	933	2.49	33.00	

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BIG BEAR RIVER NEAR RED BAY, ALA.

Location.—At Norman Bridge, 2½ miles east of Red Bay and about 4 miles below Blue Creek.

Records available.—August 24 to September 30, 1913.

Gage.—Vertical staff gage attached to a sweet gum tree on left bank 25 feet upstream from bridge; read daily, morning and evening, to tenths.

Control.—Probably shifting; at extreme low water current sluggish and irregular.

Discharge measurements.—Made from the bridge.

Winter flow.—Not affected by ice.

Cooperation.—Gage readings furnished by the Geological Survey of Alabama.

The following discharge measurement was made by W. E. Hall:

August 24, 1913: Gage height, 0.70 foot; discharge, 39 second-feet.

Daily gage height, in feet, of Big Bear River near Red Bay, Ala., for the year ending Sept. 30, 1913.

Day.	Aug.	Sept.	Day.	Aug.	Sept.	Day.	Aug.	Sept.
1	.....	0.6	11	.....	0.6	21	.....	1.15
2	.....	.6	12	.....	.6	22	.....	.95
3	.....	.6	13	.....	.6	23	.....	.85
4	.....	.6	14	.....	.6	24	0.7	.8
5	.....	.6	15	.....	.6	25	.75	.8
6	.....	.6	16	.....	.6	26	.7	.7
7	.....	.6	17	.....	.6	27	.7	.7
8	.....	.6	18	.....	.95	28	.7	.7
9	.....	.6	19	.....	1.15	29	.65	1.35
10	.....	.6	20	.....	1.2	30	.65	2.8
						31	.6	.....

MISCELLANEOUS FLOOD STAGES.

Miscellaneous flood stages for gaging stations in the Ohio River basin during the flood of March–April, 1913.

Stream.	Date.	Gage height.
		Feet.
Little Wabash River at Golden Gate, Ill.	Mar. 27	28.8
Little Wabash River at Carmi, Ill.	Mar. 29	[a] 36.3
Skillet Fork River at Wayne City, Ill.	(b)	26.5

[a] Crest stage. [b] Gage was read once during the flood; date not known.

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DRAINAGE AREAS.

Drainage areas above certain points on Ohio River and some of its principal tributaries.[a]

River.	Point.	Area (square miles).[b]
Allegheny	Kittanning, Pa	[c] 8,935
Do	Mouth of Kiskiminitas River	[d] 9,300
Do	Freeport, Pa. (includes Buffalo Creek)	11,350
Do	Mouth	11,680
Ohio	Pittsburgh, Pa	19,020
Do	Davis Island Dam, Pa	19,310
Do	Beaver Dam, Pa. (Dam No. 6)	22,690
Do	Wheeling, W. Va. (includes both Wheeling Creeks)	24,980
Do	Marietta, Ohio (includes Muskingum River)	35,560
Do	Parkersburg, W. Va. (includes Little Kanawha River)	37,950
Do	Point Pleasant, W. Va. (includes Kanawha River)	52,690
Do	Catlettsburg, Ky. (includes Big Sandy River)	60,570
Do	Portsmouth, Ohio (includes Scioto River)	68,730
Do	Cincinnati, Ohio (includes Licking River)	76,320
Do	Mouth of Miami River	[d] 76,580
Do	Mouth of Kentucky River	[d] 83,130
Do	Louisville, Ky	91,190
Do	Evansville, Ind	107,100
Do	Mouth of Wabash River	[d] 107,700
Do	Mouth of Cumberland River	[d] 144,000
Do	Paducah, Ky. (includes Tennessee River)	202,700
Do	Cairo, Ill. (total Ohio River)	203,900
Kiskiminitas	Avonmore, Pa	[c] 1,729
Do	Mouth	1,883
Monongahela	Morgantown, W. Va. (includes Deckers Creek)	2,674
Do	Mouth	7,339
Muskingum	....do	8,083
Little Kanawha	....do	2,339
Kanawha	....do	12,200
Big Sandy	....do	4,265
Scioto	....do	6,410
Licking	Falmouth, Ky. (includes South Fork)	3,237
Do	Mouth	3,636
South Fork of Licking	....do	943
Miami	....do	5,410
Kentucky	Frankfort, Ky	5,410
Do	Mouth	6,912
Wabash	Mount Carmel, Ill	28,590
Do	Mouth	32,890
Cumberland	Nashville, Tenn	12,860
Do	Mouth	17,860
Tennessee	Chattanooga, Tenn	21,420
Do	Florence, Ala	30,790
Do	Johnsonville, Tenn	38,470
Do	Mouth	40,740

[a] These areas were determined in July, 1914, from 1 : 500,000 scale state maps published by the United States Geological Survey, with the exception of the areas of Kanawha River and of Tennessee River above Chattanooga, Tenn., which areas were determined from topographic sheets.

[b] Four significant figures published in this table, but three significant figures in body of report. Attempts should not be made to determine small intermediate areas by subtraction of values in this table unless it be understood that values so determined are subject to errors which may be as great as 100 square miles.

[c] Values other than these used in body of report.

[d] Area of tributary not included.

SUMMARY OF DISCHARGE PER SQUARE MILE.

The following summary of discharge per square mile is given to allow ready comparison of relative rates of run-off from different areas in the Ohio River drainage system. It shows in a general way the seasonal distribution of run-off and the effect of snow, ground, surface, and artificial storage. But the most important fact worth noting is the almost entire lack of uniformity or agreement between any two streams. It indicates that the discharge of each stream is a law unto itself, and that all projects dependent upon stream flow, if they are to be developed along the safest and most economical lines, must be based on records of stream flow collected with great care over a long series of years as near the location of the project under consideration as possible.

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Summary of discharge, in second-feet per square mile, for river stations in the Ohio River drainage basin in the year ending Sept. 30, 1913.

Station.	Drainage area.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Year.
	Sq. mi.													
Allegheny River at Red House, N. Y	1,640	1.26	1.55	1.84	6.22	1.22	5.84	3.30	1.86	0.56	0.27	0.17	0.14	2.04
Allegheny River at Kittanning, Pa	9,010	1.72	1.40	1.62	6.89	1.94	6.25	2.44	1.42	.90	.43	.17	.14	2.12
Kiskiminitas River at Avonmore, Pa	1,720	1.66	1.24	1.16	5.99	1.44	2.74	1.23	1.86	.70	.37	.24	.29	1.59
Blacklick Creek at Blacklick, Pa	386	2.21	1.09	1.61	7.93	1.71	3.50	1.23	2.75	.70	.29	.26	.16	1.97
Tygart River at Belington, W. Va	390	.23	.85	1.19	5.18	2.10	3.13	2.42	3.62	1.02	2.06	1.22	.72	1.98
Tygart River at Fetterman, W. Va	1,340	.21	.86	1.15	5.43	2.41	2.80	1.78	3.82	1.13	1.83	1.13	.38	1.92
West Fork River at Enterprise, W. Va	750	.15	.31	.73	5.45	1.77	2.24	.78	2.91	.46	.69	.25	.08	1.33
Cheat River near Morgantown, W. Va	1,380	.73	1.68	1.46	6.58	2.28	3.80	2.30	4.54	1.49	2.25	.75	.53	2.38
Shavers Fork at Parsons, W. Va	210	.63	2.43	1.21	4.95	2.30	5.95	4.11	5.48	1.47	2.98	1.98	1.27	2.91
New River at Radford, Va	2,720	.61	.73	.66	1.14	1.03	3.43	2.11	2.08	1.31	.86	.72	1.03	1.31
Greenbrier River at Alderson, W. Va	1,340	.19	.57	.78	3.19	1.63	4.80	2.91	2.07	1.24	.86	.48	.14	1.57
Dix River near Burgin, Ky	416	.06	.26	1.89	16.3	2.62	7.07	1.08	1.34	.84	.10	.12	.03	2.67
East Branch of White River at Shoals, Ind	4,900	.18	.20	.16	5.06	.97								
French Broad River at Asheville, N. C	987	1.18	1.26	1.31	1.71	2.03	5.53	3.69	2.32	1.93	1.36	1.53	1.47	2.11
Tennessee River at Chattanooga, Tenn	21,400	.61	.56	1.11	3.54	2.41	4.77	2.29	1.78	1.53	.64	.58	.42	1.68
Tennessee River at Florence, Ala	30,800	.53	.45	1.05	4.03	3.19	4.94	2.65	1.46	1.36	.54	.50	.37	1.75
Tennessee River at Johnsonville, Tenn	38,500	.51	.42	1.02	4.18	3.40	4.78	3.09	1.14	1.28	.51	.45	.33	1.75
South Fork of Holston River at Bluff City, Tenn	828	.42	.51	.63	2.36	2.03	4.26	1.86	2.20	1.26	.59	.54	.55	1.44
Holston River near Rogersville, Tenn	3,060	.44	.46	.60	2.42	1.73								
Little Tennessee River at McGhee, Tenn	2,470	1.21	1.15	1.91	3.77	4.00	7.29	3.54	2.87	1.99	1.27	1.17	.89	2.58
Tuckasegee River at Bryson, N. C	662	1.18	1.11	1.66	2.81	3.60	7.61	3.50	2.58	1.98	1.39	1.39	1.13	2.49
Hiwassee River at Murphy, N. C	410	1.10	1.08	1.44	2.56	2.93	7.15	2.73	2.05	1.89	1.09	.94	.73	2.14
Hiwassee River at Reliance, Tenn	1,180	1.14	.99	1.36	2.93	3.53								
Ocoee River at Copper Hill, Tenn	374	1.56	1.41	1.68	2.86	3.77	6.60	3.77	2.94	2.05	1.28	1.21	.88	2.49

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APPENDIX.

A condensed history of the United States Engineer Corps gage on Tennessee River at Florence, Ala., was prepared at the office of the secretary of the Mississippi River Commission, St. Louis, Mo., under the direction of Maj. Clarke S. Smith, Corps of Engineers, United States Army, by Kivas Tully, assistant engineer, and was forwarded to the Survey in January, 1915, too late to be incorporated in the description of the Florence station on pages 151–157. A few changes were made in the description under "Gage" and "Bench marks" from information contained in the commission's history of the gage, and the description agrees with the history in all essential details. No change was made in the next to the last paragraph under "Gage," and it will be observed that the conclusions therein agree with those under "Recapitulation" in the history of the gage.

In order to make the gage record as complete as possible for the period 1871–1894, for which no estimates of discharge are published, the description of the Florence station on pages 151–157 is supplemented by the following extracts from the condensed history furnished by the Mississippi River Commission:

Condensed history of the United States Engineer Corps gage on the Tennessee River at Florence, Ala.

This gage was established under authority of act of Congress of January 21, 1871, by Maj. William E. Merrill, Corps of Engineers, United States Army, on November 6, 1871. See Report Chief of Engineers, 1872, page 430. * * *

The following is taken from Maj. Merrill's first report above referred to:

"*Florence gage.*—This gage is located just below the north abutment of the railroad bridge over the Tennessee River, the upper portion of the gage being on the abutment. Plank and posts are of yellow pine. The zero is the low water of 1871 and the range of the gage is from 0.4 to +33.8. The bench marks are the southwest corner of the top of first small pier, north of the bridge, which reads 30.193, and the top of the northwest corner of the bridge seat on the abutment, which reads 32.261. The observer is Mr. W. P. Stradford."

The original records of the engineer gage received at this office in 1901, when charge of these gages was transferred here, do not contain the field notes of the gage inspections prior to 1885, and inquiry at Washington and elsewhere has failed to locate them.

The first record of gage inspection is * * * stated to be by Capt. Eric Bergland, November 24, 1885. This entry is possibly a copy from some other book and does not contain level notes; it states "On December 23, 1885, Asst. Engineer Robert Hooke tested gage from B. M. No. 1, * * * finding portion correct, and on the inclined portion, 0′ to 19′, the following elevations: XIX on gage 18.906, XIII on gage 12.936, VII on gage 6.981."

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No corrections have been applied to gage record for errors found in gage at above inspection. * * *

A gage inspection report by Asst. Engineer John Ewens dated March 22, 1887, * * * states: "The present gage is the original one, and (the observer says) has never been disturbed * * *."

The upper section of the gage is so fixed that a movement in any direction is quite impossible by any of the means of disturbance generally encountered; it is attached to the downstream face of the downstream and shore abutment of the bridge; it is fastened by huge iron bolts sunk into the rock and ended with huge iron nuts. The inclined portion (that reads from 19 to 0.0), though not so formidably built, has not changed any more than the vertical section just described."

From the above description, the original gage must have been inclined from 0.4 foot to 19 feet and vertical from 19 feet to 33.8 feet. * * *

Two bench marks were established at the time the gage was built; one of these has since been destroyed. Several other benches have been established near by at different times. * * *

October 23, 1894. Report of inspections received early in 1894 * * * states: "Last inspection April 19, 1890."—K. T.

"The gage from 34.0 feet to 9.1 feet on downstream face of rock approach to the bridge; the remaining sections were located about 50 feet above; the rock shoal opposite the latter site and the approach piling to the draw opening that has been put in since last inspection causes the water at present stage (and up to a stage of 6.0 feet, the gage keeper says) to pile up on that side a height of nearly 1 foot above the natural surface of the water. To overcome this completely, this part of the gage was moved down to same (river) cross section as upper part of the gage, where the water surface is normal at all stages. The recent repairs to the bridge enabled me to put a section reading from −2.0 to 21.0 on cribwork of the pivot pier near downstream side, directly in line with upper portion of the gage; this site is about 75 feet from the bank at present stage. The water-surface elevation was taken at the bank and at this site and found to be the same. At the former low-water site it was found to be +0.83 foot higher. * * *"

Recapitulation.—Original gage established November 6, 1871, in two sections, one inclined from 0.4 foot to 19.0 feet and the other vertical from 19.0 to 33.8 feet. This gage remained practically intact until August 18, 1889, when it was rebuilt with four vertical sections, as follows:

No. 1, 34 feet to 18 feet; No. 2, 19.0 feet to 9.0 feet; No. 3, 10.0 to 6.2 feet; No. 4, 6.2 to 0.0 feet.

Description of gages for 1893 * * * contains the following: "Vertical gage in 3 sections, * * * sections 1 and 2 (34.0 to 18) (19.0 to 9.1) are on lower face of rock approach to bridge. Section 3 (10.0 to 0.0) is driven in the ground on upper side of approach to which sections 1 and 2 are fastened." It is not known exactly when this section 3 was put in.

The inspection of October 23, 1894, describes the gage practically the same as in the preceding paragraph. No correction has been made to the records for slope from low-water section while it was upstream from other sections. The gage was then rebuilt from −2 to 21 feet and placed on the cribwork of the pivot pier of the draw span near downstream side, directly in line with the upper portion of the gage (see note on this alignment * * *). The gage remained in this position until November 6, 1898, when it was built in one section from −2.1 to 32.6 feet on the cribwork of pivot pier. It was inspected several times from 1894 to 1898 and rebuilt as settlement of cribwork made it necessary. It was maintained in one section on the cribwork until November 15, 1901, when the present steel gage was built by this office. The installation of this gage was completed on February 14, 1902, and it has been in use

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since then, with exception of short periods of time when the lower section was knocked off or paint was washed off too much to be read. Whenever this has occurred a temporary section was used, and the records corrected for any error before publication.

The present gage consists of sections of steel ⅜ by 7½ inches attached to face of stone draw pier of Southern Railway bridge, by bolts leaded in stone. These are graduated to allow for batter of pier, which is 1 inch to 1 foot. These sections make one continuous gage reading from −1.92 to 33.5 feet.

The foregoing has been held until after the low-water inspection of 1914 in order that additional information might be added concerning records of 1890–1894.

This inspection was made under my direction by Assistant Engineer Kivas Tully, on November 19 and 20, 1914, with the following results: The gage was found practically correct, but the lower graduations were rather indistinct on account of the paint being somewhat worn off by action of the water. Slope of water surface was also determined along the right bank above and below the bridge for a short distance; the results show a slope at the bridge of about 0.8 foot in 100 feet, at about the zero stage which then prevailed.

Mr. Robert E. Coburn, observer at this station since November, 1882, was closely questioned in regard to location of low-water section during the period from April 19, 1890, to October 23, 1894, and stated that he had no recollection of where the low-water section was located during that period.

He pointed out the site of the gage before described as being attached to "lower face of rock approach," etc. Some of the bolts which undoubtedly held this gage are still in place but the gage itself has disappeared.

It should be noted that the alignment of the bridge is not normal to direction of flow of the river; therefore while the gages on the shore abutment were in line of the bridge they were not on a line normal to the river flow, which they should have been to agree with later gages at the pivot pier. No corrections have been determined for differences due to this fact.

The daily records at this station from November 7, 1871, to date are complete, and with the exception of the period in 1893–94 and possibly earlier, when readings were taken on the section readings from 0 to 10 feet before described, are very good. The records have been corrected before printing for errors found in the gage at inspections where such errors were well determined. The printed records, with the exceptions noted, can therefore be accepted as reliable.

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WATER-SUPPLY PAPER 354

SURFACE WATER SUPPLY OF THE UNITED STATES

1913

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N. C. GROVER, Chief Hydraulic Engineer

W. G. HOYT, A. H. HORTON, and C. C. COVERT, District Engineers

Prepared in cooperation with the States of Minnesota, New York, and Vermont

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SURFACE WATER SUPPLY OF ST. LAWRENCE RIVER BASIN, 1913.

AUTHORIZATION AND SCOPE OF WORK.

This volume is one of a series of 12 reports presenting results of measurements of flow made on streams in the United States during 1913. Six of the reports for 1913 contain data for the year ending September 30, and the other six for the calendar year, as indicated in the table on page 6.

The data presented in these reports were collected by the United States Geological Survey under authority implied in the organic law (20 Stat. L., p. 394), which contains the following paragraph:

Provided, That this officer [the Director] shall have the direction of the geological survey and the classification of public lands, and examination of the geological structure, mineral resources, and products of the national domain.

The work was begun in 1888 in connection with special studies of water supply for irrigation. Since the fiscal year ending June 30, 1895, successive sundry civil bills passed by Congress have carried the following item and appropriations:

For gaging the streams and determining the water supply of the United States, and for the investigation of underground currents and artesian wells, and for the preparation of reports upon the best methods of utilizing the water resources:

Annual appropriations for the fiscal years ending June 30, 1895–1914.

1895	$12,500
1896	20,000
1897 to 1900, inclusive	50,000
1901 to 1902, inclusive	100,000
1903 to 1906, inclusive	200,000
1907	150,000
1908 to 1910, inclusive	100,000
1911 to 1914, inclusive	150,000

In the execution of the work many private and State organizations have cooperated, either by furnishing data or by assisting financially in collecting the data. Acknowledgments for cooperation of the first kind are made in connection with the description of each station affected and of the second kind on page 15.

Measurements of stream flow have been made at about 3,000 points in the United States and also at many points in small areas in Seward Peninsula and the Yukon-Tanana region, Alaska, and in

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the Hawaiian Islands. On July 1, 1913, 1,388 gaging stations were being maintained by the Survey and the cooperating organizations in the United States, and during the year many miscellaneous discharge measurements were made at other points. In connection with this work, data were also collected in regard to precipitation, evaporation, storage reservoirs, river profiles, and water power in many sections of the country, and will be made available in the regular water-supply papers from time to time.

PUBLICATIONS.

A report for each year has been prepared embodying the stream-flow data collected during that year. An index to the reports containing stream-flow measurements prior to 1904 has been published as Water-Supply Paper 119. Circulars are also available giving complete lists of the gaging stations maintained by the Survey to date, and a list of the reports relating to the water supply of the country.

Prior to 1901 gage heights and discharge measurements were published in water-supply papers or bulletins, and estimates of monthly discharge in annual reports; since 1901 both classes of data have been published in water-supply papers, and they are now being published in 12 parts, as shown in the following table:

Papers on surface water supply of the United States, 1913.

Part.	No.	Title.	Year used.
I	351	North Atlantic basins	Calendar year.
II	352	South Atlantic and eastern Gulf of Mexico basins.	Do.
III	353	Ohio River basin	Year ending Sept. 30.
IV	354	St. Lawrence River basin	Calendar year.
V	355	Upper Mississippi River and Hudson Bay basins.	Year ending Sept. 30.
VI	356	Missouri River basin	Calendar year.
VII	357	Lower Mississippi River basin	Do.
VIII	358	Western Gulf of Mexico basins	Year ending Sept. 30.
IX	359	Colorado River basin	Calendar year.
X	360	Great Basin	Year ending Sept. 30.
XI	361	Pacific basins in California	Do.
XII	362	North Pacific basins	Do.

A list of reports containing stream-flow data is presented in the following table:

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Stream-flow data in reports of the United States Geological Survey.

[A—Annual Report; B—Bulletin; WS—Water-Supply Paper.]

Report.	Character of data.	Year.
10th A, pt. 2	Descriptive information only	
11th A, pt. 2	Monthly discharge and descriptive information	1884 to Sept., 1890.
12th A, pt. 2	....do	1884 to June 30, 1891.
13th A, pt. 3	Mean discharge in second-feet	1884 to Dec. 31, 1892.
14th A, pt. 2	Monthly discharge (long-time records, 1871 to 1893)	1888 to Dec. 31, 1893.
B 121	Descriptions, measurements, gage heights, and ratings	1893 and 1894.
16th A, pt. 2	Descriptive information only	
B 140	Descriptions, measurements, gage heights, ratings, and monthly discharge (also many data covering earlier years).	1895.
WS 11	Gage heights (also gage heights for earlier years)	1896.
18th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also similar data for some earlier years).	1895 and 1896.
WS 15	Descriptions, measurements, and gage heights, eastern United States, eastern Mississippi River, and Missouri River above junction with Kansas.	1897.
WS 16	Descriptions, measurements, and gage heights, western Mississippi River below junction of Missouri and Platte, and western United States.	1897.
19th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also some long-time records).	1897.
WS 27	Measurements, ratings, and gage heights, eastern United States, eastern Mississippi River, and Missouri River.	1898.
WS 28	Measurements, ratings, and gage heights, Arkansas River and western United States.	1898.
20th A, pt. 4	Monthly discharge (also for many earlier years)	1898.
WS 35 to 39	Descriptions, measurements, gage heights, and ratings	1899.
21st A, pt. 4	Monthly discharge	1899.
WS 47 to 52	Descriptions, measurements, gage heights, and ratings	1900.
22d A, pt. 4	Monthly discharge	1900.
WS 65, 66	Descriptions, measurements, gage heights, and ratings	1901.
WS 75	Monthly discharge	1901.
WS 82 to 85	Complete data	1902.
WS 97 to 100	....do	1903.
WS 124 to 135	....do	1904.
WS 165 to 178	....do	1905.
WS 201 to 214	....do	1906.
WS 241 to 252	....do	1907–8.
WS 261 to 272	....do	1909.
WS 281 to 292	....do	1910.
WS 301 to 312	....do	1911.
WS 321 to 332 [a]	....do	1912.
WS 351 to 362 [a]	....do	1913.

[a] In preparation.

NOTE.—No data regarding stream flow are given in the 15th and 17th annual reports.

The following table gives, by years and drainage basins, the numbers of the papers on surface water supply published from 1899 to 1913. The data for any particular station will be found in the reports covering the years during which the station was maintained. For example, data for Machias River at Whitneyville, Me., 1903 to 1913, are published in Water-Supply Papers 97, 124, 165, 201, 241, 261, 281, 301, 321, and 351, which contain records for the New England streams from 1903 to 1913. Results of miscellaneous measurements are published by drainage basins.

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Numbers of water-supply papers containing results of stream measurements, 1899–1913.

	1899 [a]	1900 [b]	1901	1902	1903	1904	1905	1906	1907–8	1909	1910	1911	1912	1913
North Atlantic coast	35	47, [c] 48	65, 75	82	97	[d] 124, [e] 125 [f] 126	[d] 165, [e] 166 [f] 167	[d] 201, [e] 202 [f] 203	241	261	281	301	321	351
South Atlantic coast and eastern Gulf of Mexico	[g] 35, 36	48	65, 75	[g] 82, 83	[g] 97, 98	[f] 126, 127	[f] 167, 168	[f] 203, 204	242	262	282	302	322	352
Ohio River basin	36	48, [h] 49	65, 75	83	98	128	169	205	243	263	283	303	323	353
St. Lawrence River and Great Lakes	36	49	65, 75	[i] 82, 83	97	129	170	206	244	264	284	304	324	354
Hudson Bay and Upper Mississippi River	36	49	[j] 65, 66, 75	[j] 83, 85	[j] 98, 99, [k] 100	[j] 128, 130	171	207	245	265	285	305	325	355
Missouri River	[l] 36, 37	49, [m] 50	66, 75	84	99	130, [n] 131	172	208	246	266	286	306	326	356
Lower Mississippi River	37	50	[j] 65, 66, 75	[j] 83, 84	[j] 98, 99	[j] 128, 131	[j] 169, 173	[j] 205, 209	247	267	287	307	327	357
Western Gulf of Mexico	37	50	66, 75	84	99	132	174	210	248	268	288	308	328	358
Colorado River	[o] 37, 38	50	66, 75	85	100	133	175, [p] 177	211	249	269	289	309	329	359
Great Basin	38, [q] 39	51	66, 75	85	100	133, [r] 134	176, [r] 177	212, [r] 213	250, [r] 251	270, [r] 271	290, [r] 291	310	330	360
California	38, [s] 39	51	66, 75	85	100	134	177	213	251	271	291	311	331	361
North Pacific coast	38	51	66, 75	85	100	135	[t] 177, 178	214	252	272	292	312	[u] 332	[u] 362

[a] Rating tables and index to Water-Supply Papers 35–39 contained in Water-Supply Paper 39.

[b] Rating tables and index to Water-Supply Papers 47–52 and data on precipitation, wells, and irrigation in California and Utah contained in Water-Supply Paper 52.

[c] Wissahickon and Schuylkill rivers to James River.

[d] New England rivers only.

[e] Hudson River to Delaware River, inclusive.

[f] Susquehana River to Yadkin River, inclusive.

[g] James River only.

[h] Scioto River.

[i] Lake Ontario and tributaries to St. Lawrence River proper.

[j] Tributaries of Mississippi from east.

[k] Hudson Bay only.

[l] Gallatin River.

[m] Loup and Platt rivers near Columbus, Nebr., and all tributaries below junction with Platte.

[n] Platte and Kansas rivers.

[o] Green and Gunnison rivers and Grand River above junction with Gunnison.

[p] Below junction with Gila.

[q] Mohave River only.

[r] Great Basin in California, excepting Truckee and Carson drainage basins.

[s] Kings and Kern rivers only.

[t] Rogue, Umpqua, and Siletz rivers only.

[u] In three parts: *A*, Pacific drainage basins in Washington and Upper Columbia River; *B*, Snake River basin; *C*, Lower Columbia River and Rogue, Umpqua, and Siletz rivers.

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Water-supply papers and other publications of the United States Geological Survey containing data in regard to the water resources of the United States may be obtained or consulted as indicated below.

1. Copies may be obtained free of charge by applying to the Director of the Geological Survey, Washington, D. C. The edition printed for free distribution is, however, small and is soon exhausted.

2. Copies may be purchased at nominal cost from the Superintendent of Documents, Government Printing Office, Washington, D. C., who will on application furnish lists giving prices.

3. Sets of the reports may be consulted in the libraries of the principal cities in the United States.

4. Complete sets are available for consultation in the local offices of the water-resources branch of the Geological Survey, as follows:

Albany, N. Y., Room 18, Federal Building.
Atlanta, Ga., Post Office Building.
St. Paul, Minn., Old Capitol Building.
Helena, Mont., Montana National Bank Building.
Denver, Colo., 302 Chamber of Commerce Building.
Salt Lake City, Utah, Federal Building.
Boise, Idaho, 615 Idaho Building.
Portland, Oreg., 416 Couch Building.
Tacoma, Wash., Federal Building.
San Francisco, Cal., 505 Custom House.
Los Angeles, Cal., Federal Building.
Santa Fe, N. Mex., Capitol Building.
Honolulu, Hawaii, Kapiolani Building.

A list of the Geological Survey's publications will be sent on application to the Director of the United States Geological Survey, Washington, D. C.

DEFINITION OF TERMS.

The volume of water flowing in a stream—the "run-off" or "discharge"—is expressed in various terms, each of which has become associated with a certain class of work. These terms may be divided into two groups: (1) Those which represent a rate of flow, as second-feet, gallons per minute, miner's inches, and discharge in second-feet per square mile; and (2) those which represent the actual quantity of water, as run-off in depth in inches, acre-feet, and millions of cubic-feet. The units used in this series of reports are second-foot, second-feet per square mile, run-off in inches, acre-foot, and millions of cubic-feet. They may be defined as follows:

"Second-foot" is an abbreviation for "cubic foot per second" and is a unit for the rate of discharge of water flowing in a stream. A second-foot is the rate of discharge of water flowing in a channel of rectangular cross section, 1 foot wide and 1 foot deep, at an average velocity of 1 foot per second. It is generally used as a

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fundamental unit from which others are computed by the use of the factors given in the tables of convenient equivalents (p. 11).

"Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly both as regards time and area.

"Run-off (depth in inches)" is the depth to which the drainage area would be covered if all the water flowing from it in a given period were conserved and uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

An "acre-foot" is equivalent to 43,560 cubic feet and is the quantity required to cover an acre to the depth of 1 foot. The term is commonly used in connection with storage for irrigation work.

"Millions of cubic-feet" is a unit used to express quantities of water stored in reservoirs and is most frequently used in studies of flood control.

The following terms used in these reports are not in very common use and may be defined as follows:

"Control," "controlling section," and "point of control" are terms used to designate that cross section of the stream below the gage which controls or regulates the height of the water surface at the gage. It should be noted that the control may not be the same cross section at all stages.

"Discharge relation" is an abbreviation for the term "relation of gage height to discharge."

The "point of zero flow" for a given gaging station is that point on the gage—the gage height—to which the surface of the river would fall if there were no flow.

CONVENIENT EQUIVALENTS.

The following is a list of convenient equivalents for use in hydraulic computations:

Table for converting discharge in second-feet per square mile into run-off in depth in inches over the area.

Discharge in second-feet per square mile.	Run-off in depth in inches.				
	1 day.	28 days.	29 days.	30 days.	31 days.
1.....	0.03719	1.041	1.079	1.116	1.153
2.....	.07438	2.083	2.157	2.231	2.306
3.....	.11157	3.124	3.236	3.347	3.459
4.....	.14876	4.165	4.314	4.463	4.612
5.....	.18595	5.207	5.393	5.579	5.764
6.....	.22314	6.248	6.471	6.694	6.917
7.....	.26033	7.289	7.550	7.810	8.070
8.....	.29752	8.331	8.628	8.926	9.223
9.....	.33471	9.372	9.707	10.041	10.376

NOTE.—For part of a month multiply the values for one day by the number of days.

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Table for converting discharge in second-feet into run-off in acre-feet.

Discharge in second-feet.	Run-off in acre-feet.				
	1 day.	28 days.	29 days.	30 days.	31 days.
1.....	1.983	55.54	57.52	59.50	61.49
2.....	3.967	111.1	115.0	119.0	123.0
3.....	5.950	166.6	172.6	178.5	184.5
4.....	7.934	222.1	230.1	238.0	246.0
5.....	9.917	277.7	287.6	297.5	307.4
6.....	11.90	333.2	345.1	357.0	368.9
7.....	13.88	388.8	402.6	416.5	430.4
8.....	15.87	444.3	460.2	476.0	491.9
9.....	17.85	499.8	517.7	535.5	553.4

NOTE.—For part of a month multiply values for one day by the number of days.

Table for converting discharge in second-feet into run-off in millions of cubic feet.

Discharge in second-feet.	Run-off in millions of cubic feet.				
	1 day.	28 days.	29 days.	30 days.	31 days.
1.....	0.0864	2.419	2.506	2.592	2.678
2.....	.1728	4.838	5.012	5.184	5.356
3.....	.2592	7.257	7.518	7.776	8.034
4.....	.3456	9.676	10.024	10.368	10.712
5.....	.4320	12.095	12.530	12.960	13.390
6.....	.5184	14.514	15.036	15.552	16.068
7.....	.6048	16.933	17.542	18.144	18.746
8.....	.6912	19.352	20.048	20.736	21.424
9.....	.7776	21.771	22.554	23.328	24.102

NOTE.—For part of a month multiply values for one day by the number of days.

1 second-foot equals 40 California miner's inches (law of Mar. 23, 1901)

1 second-foot equals 38.4 Colorado miner's inches.

1 second-foot equals 40 Arizona miner's inches.

1 second-foot equals 7.48 United States gallons per second; equals 448.8 gallons per minute; equals 646,317 gallons for one day.

1 second-foot for one year covers 1 square mile 1.131 feet or 13.572 inches deep.

1 second-foot for one year equals 31,536,000 cubic feet.

1 second-foot equals about 1 acre-inch per hour.

1 second-foot for one day covers 1 square mile 0.03719 inch deep.

1 second-foot for one day equals 86,400 cubic feet.

1,000,000,000 (1 United States billion) cubic feet equals 11,570 second-feet for one day.

1,000,000,000 cubic-feet equals 414 second-feet for one 28-day month.

1,000,000,000 cubic feet equals 399 second-feet for one 29-day month.

1,000,000,000 cubic feet equals 386 second-feet for one 30-day month.

1,000,000,000 cubic feet equals 373 second-feet for one 31-day month.

100 California miner's inches equal 18.7 United States gallons per second.

100 California miner's inches for one day equal 4.96 acre-feet.

100 Colorado miner's inches equal 2.60 second-feet.

100 Colorado miner's inches equal 19.5 United States gallons per second.

100 Colorado miner's inches for one day equal 5.17 acre-feet.

100 United States gallons per minute equal 0.223 second-foot.

100 United States gallons per minute for one day equal 0.442 acre-foot.

1,000,000 United States gallons per day equal 1.55 second-feet.

1,000,000 United States gallons equal 3.07 acre-feet.

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1,000,000 cubic feet equal 22.95 acre-feet.
1 acre-foot equals 325,850 gallons.
1 inch deep on 1 square mile equals 2,323,200 cubic feet.
1 inch deep on 1 square mile equals 0.0737 second-foot per year.
1 foot equals 0.3048 meter.
1 mile equals 1.60935 kilometers.
1 mile equals 5,280 feet.
1 acre equals 0.4047 hectare.
1 acre equals 43,560 square feet.
1 acre equals 209 feet square, nearly.
1 square mile equals 2.59 square kilometers.
1 cubic foot equals 0.0283 cubic meter.
1 cubic foot of water weighs 62.5 pounds.
1 cubic meter per minute equals 0.5886 second-foot.
1 horsepower equals 550 foot-pounds per second.
1 horsepower equals 76.0 kilogram-meters per second.
1 horsepower equals 746 watts.
1 horsepower equals 1 second-foot falling 8.80 feet.
1½ horsepower equals about 1 kilowatt.

To calculate water power quickly: $\frac{\text{Sec.-ft.} \times \text{fall in feet}}{11}$ = net horsepower on water wheel realizing 80 per cent of theoretical power.

EXPLANATION OF DATA.

For each regular current-meter gaging station the following data are given: Description of the station, list of discharge measurements, table of daily gage height, table of daily discharge, table of monthly and yearly discharge and run-off. For stations located at weirs or dams the gage-height table is usually omitted.

In addition to statements regarding the location and installation of current-meter stations, the descriptions give information in regard to any conditions which may affect the constancy of the relation of gage height to discharge, covering such points as ice, logging, shifting channels, and backwater; also information regarding diversions which decrease the total flow at the measuring section. Statements are also made regarding the accuracy of the data.

The table of daily gage height shows the daily fluctuations of the surface of the river as found from the mean of the gage readings taken each day, usually in the morning and in the evening, though at many stations only one reading is made each day. At a comparatively few stations automatic gages are used, some of which give a continuous record of river stage in the form of an hydrograph, and others a record printed at regular intervals, from which the mean daily gage height can be computed. The gage height given in the table represents the elevation of the surface of the water above the zero of the gage. All gage heights affected by the presence of ice in the streams or by backwater from obstructions are published as recorded, with suitable footnotes. The rating

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table is not applicable for such periods unless the proper corrections to the gage heights are known and applied. Attention is called to the fact that the zero of the gage is placed at an arbitrary datum and has no relation to zero flow or the bottom of the river. In general the zero is located somewhat below the lowest known flow, so that negative readings shall not occur.

In the tables of daily gage height the use of zeros in the hundredths place indicates the limits of accuracy to which the gage was read and to which the mean daily gage height was computed. If a gage is read to tenths or half-tenths once a day or to tenths twice a day no zeros appear in the hundredths place for any stage. If the gage is read to half-tenths twice a day or to quarter-tenths or hundredths, regardless of the number of readings a day, the gage heights are published to hundredths, and zeros appear in the hundredths place, below a certain limiting stage. This limiting stage is so selected that the average error in the mean daily discharge, resulting from not using the mean daily gage height to hundredths above that stage, shall not be greater than 2 per cent. For automatic gages the allowable average error of the daily discharge has been taken as 1 per cent. The selection of the percentage is arbitrary, but it should be noted that the maximum error will in all cases be twice the average error. In like manner half tenths are used from the hundredths limit to another higher limit, above which only tenths are used. It is the aim to have the gage-height observations at each gaging station recorded to the degree of refinement required by the above-described method of use, but in practice it is found necessary, in order to avoid confusion in the gage observer's record, to have the observations for all stages recorded to the degree of refinement required for low stages, which usually necessitates readings to hundredths of a foot.

The discharge measurements and gage heights are the base data from which rating tables, daily discharge tables, and monthly discharge tables are computed.

The rating table gives, either directly or by interpolation, the discharge in second-feet corresponding to every stage of the river recorded during the period for which it is applicable. It is not published in this report, but can be determined from the tables of daily gage height and daily discharge by plotting gage heights in feet as ordinates and discharge in second-feet as abscissas.

The table of daily discharge determined from the rating table gives the discharge in second-feet corresponding to the mean of the gage readings observed each day.

The base data for the tables of monthly discharge presented in this report, unless otherwise stated in the description of the station, have been collected by the methods commonly used at current-meter gaging stations and described in standard textbooks.

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In the table of monthly discharge the column headed "Maximum" gives the mean flow, as determined from the rating table, for the day when the mean gage height was highest. As the gage height is the mean for the day, it does not indicate correctly the stage when the water surface was at crest height, and the corresponding discharge was consequently larger than given in the maximum column. Likewise, in the column of "Minimum" the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" is the average flow in cubic feet for each second-foot during the month. On this the computations for the remaining columns, which are defined on pages 9 and 10, are based.

Plate I shows typical gaging stations. Plate II shows current meters used in the work.

ACCURACY OF FIELD DATA AND COMPUTED RESULTS.

The accuracy of stream-flow data depends on the permanence of the relation between discharge and stage and on the accuracy of observation of stage, measurements of discharge, and interpretation of data.

In order to give engineers and others information regarding the probable accuracy of the computed results, footnotes are added to the daily discharge tables, stating the probable accuracy of the rating curves used, and an accuracy column is inserted in the monthly discharge table. For the rating curves "well defined" indicates, in general, that the rating is probably accurate within 5 per cent; "fairly well defined," within 10 per cent; "poorly defined" or "approximate," within 15 to 25 per cent. These notes are very general and are based on the plotting of the individual measurements with reference to the mean rating curve.

The accuracy column in the monthly discharge table does not apply to the maximum or minimum nor to any individual day, but to the monthly mean. It is based on the accuracy of the rating, the probable reliability of the observer, the number of gage readings per day, the range of the fluctuation in stage, and knowledge of local conditions. In this column A indicates that the mean monthly flow is probably accurate within 5 per cent; B, within 10 per cent; C, within 15 per cent; D, within 25 per cent. Special conditions are covered by footnotes.

Even though the monthly means for any station may represent with a high degree of accuracy the quantity of water flowing past the gage, the figures showing discharge per square mile and depth of run-off in inches may be subject to gross errors which result from including in the measured drainage area large noncontributing districts or omitting estimates of water diverted for irrigation or other use. On this account the computations of "second-feet per square mile" and "run-off, depth in inches" have not been made for stations draining areas having an annual rainfall of less than 20 inches, nor for those

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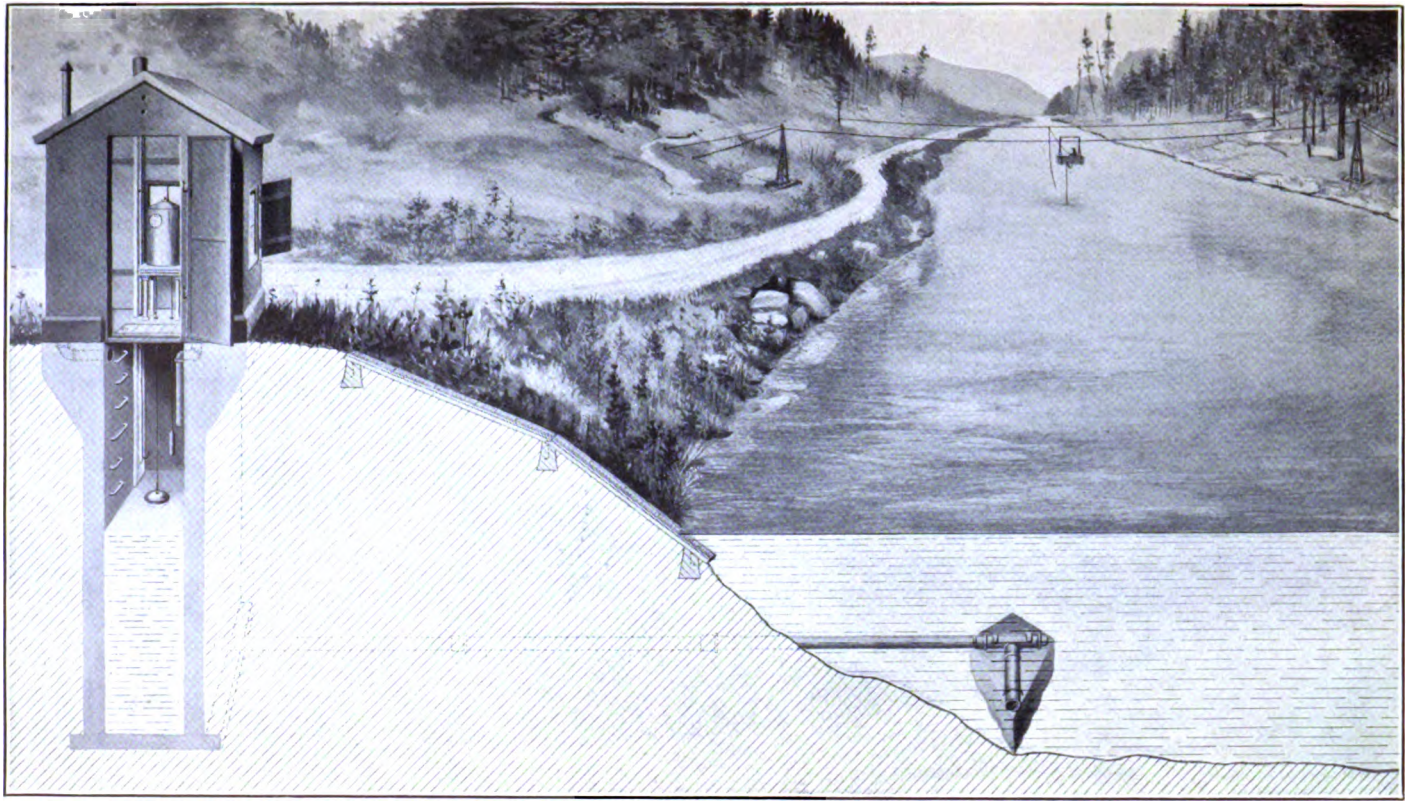

TYPICAL GAGING STATIONS.

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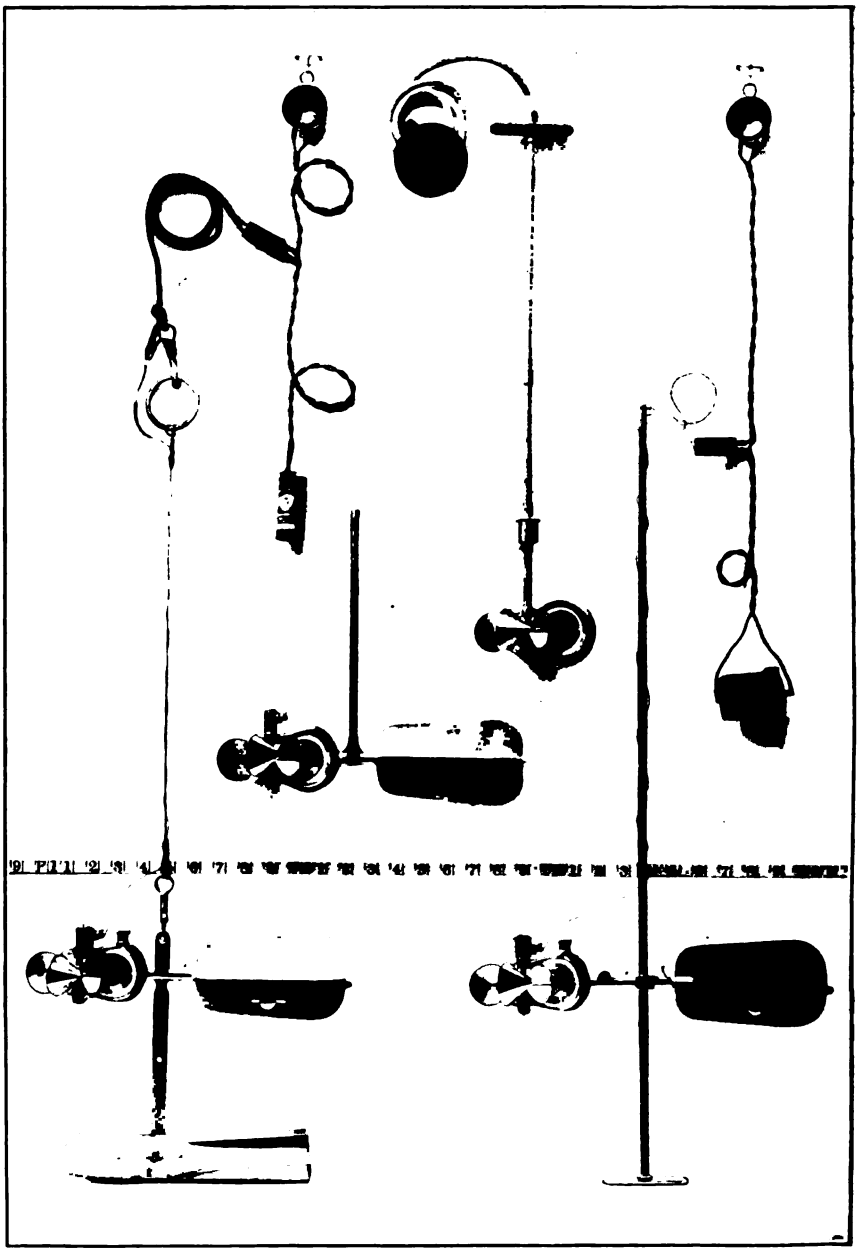

PRICE CURRENT METERS.

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stations draining areas of over 20 inches of rainfall for which it is believed that the computations would be uncertain and misleading because of the presence of large noncontributing districts in the measured drainage area, of omitting estimates of water diverted for irrigation or other use, or of artificial control or unusual natural control of the flow of the river above the gaging station. All values of "second-feet per square mile" and "run-off, depth in inches" previously published by the Survey should be used with extreme caution, and such values in this report should be used with care because of possible inherent sources of error not known to the Survey.

In general the base data collected each year by the Survey engineers are published, not only to comply with the law, but also to afford any engineer the means of examining and adjusting to his own needs the results of the computations. The table of monthly discharge is so arranged as to give only a general idea of the flow at the station and should not be used for other than preliminary estimates. The determinations of daily discharge allow more detailed studies of the variation in flow by which the period of deficiency may be determined.

It should be borne in mind that the observations in each succeeding year may be expected to throw new light on data already collected and published, and the engineer who makes use of the figures presented in these papers should verify all ratings and make such adjustments for earlier years as may seem necessary.

COOPERATION.

The work in Minnesota during 1913 has been carried on in cooperation with the State drainage commission, George A. Ralph, chief engineer, under the terms of an act of the legislature of 1909 as embodied in joint resolution 19, which reads as follows:

> Whereas the water supplies, water powers, navigation of our rivers, drainage of our lands, and the sanitary condition of our streams and their watersheds generally form one great asset and present one great problem: Therefore be it
>
> *Resolved by the house of representatives, the senate concurring*, That the State drainage commission be, and is hereby, directed to investigate progress in other States toward the solution of said problem in such States, to investigate and determine the nature of soil problem in this State.

Assistance has been rendered by the Oliver Iron Mining Co., which paid the salary of the observer on Menominee River near Iron Mountain.

The gaging stations on Wolf River in the Menominee Indian Reservation were maintained in cooperation with the Office of Indian Affairs, under an allotment made available January 1, 1913.

The gaging station on Escanaba River near Escanaba, Mich., has been maintained in cooperation with the Geological Survey of the State of Michigan.

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Work in the State of New York has been conducted under cooperative agreements with John A. Bensel, State engineer and surveyor, and since July 1, 1911, with the division of inland waters of the State conservation commission.

The work in Vermont during 1913 has been done in cooperation with the State of Vermont, Allen M. Fletcher, governor.

DIVISION OF WORK.

The field data in the Lake Superior and part of Lake Michigan drainage basins were collected under the direction of W. G. Hoyt, district engineer, by S. B. Soulé and B. J. Peterson.

The field data in the Lake Michigan, Lake Huron, and Lake Erie drainage basins were collected under the direction of A. H. Horton.

The field data in the St. Lawrence drainage basin in New York and Vermont were collected under the direction of C. C. Covert, by O. W. Hartwell, G. H. Canfield, C. S. De Golyer, Frank Weber, J. G. Mathers, R. S. Barnes, G. J. Lyon, and W. S. Easterly.

The ratings, special estimates, and studies of the completed data for stations outside of New York and Vermont were made by B. J. Peterson under the direction of H. J. Jackson, and by W. G. Hoyt.

The computations were made under the direction of B. J. Peterson by M. I. Walters, J. H. Morgan, and E. D. Burchard.

The ratings, special estimates, and studies of the completed data for stations in New York and Vermont were made by C. C. Covert and O. W. Hartwell. The computations were made under the direction of O. W. Hartwell, by C. S. De Golyer, Frank Weber, R. S. Barnes, and W. S. Easterly.

The report was edited by Mrs. B. D. Wood.

GAGING-STATION RECORDS.

STREAMS TRIBUTARY TO LAKE SUPERIOR.

POPLAR RIVER AT LUTSEN, MINN.

Location.—In sec. 34, T. 60 N., R. 3 W., about 800 feet above mouth of river.

Records available.—May 6 to November 4, 1911; August 22, 1912, to December 31, 1913.

Drainage area.—144 square miles.

Gage.—Staff gage bolted to rock wall on right bank, in a pool between two distinct falls; installed August 26, 1912. Gage used May 6 to November 4, 1911, was a staff about 400 feet above mouth of river.

Control.—Crest of falls below gage. Channel solid rock.

Discharge measurements.—Made by wading.

Point of zero flow.—Approximately at gage height 0.35 foot.

Winter flow.—Discharge relation affected slightly by ice. Measurements and frequent gage observations to determine the winter flow.

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Regulation.—Flow controlled to some extent by two dams above the station, the nearest being that of National Paper & Pulp Co., 2½ miles above mouth of river.

Accuracy.—Gage so situated that, except for periods during which ice exists at control and temporary drift is lodged on rapids below, records should be reliable.

Discharge measurements of Poplar River at Lutsen, Minn., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Jan. 11	S. B. Soulé	0.84	12.0
12	do	.78	10.5
June 12[a]	do	1.97	148
12[a]	do	1.94	136

[a] Measurement made by wading.

Daily gage height, in feet, of Poplar River at Lutsen, Minn., for 1913.

[C. A. A. Nelson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	0.85	0.85	0.85	2.1	1.94	1.70	1.48	1.15	1.14	1.54	1.69
2	.....	.....	.....	.85	2.0	1.99	1.58	1.38	1.12	1.15	1.51	1.68
3	.....	.....	.....	.85	2.0	2.0	1.49	1.32	1.10	1.12	1.49	1.64
4	0.8	.....	.....	.85	2.05	2.0	1.44	1.29	1.12	1.21	1.46	1.50
5	.....	.....	.....	.85	2.0	2.0	1.90	1.22	1.29	2.55	1.45	1.46
6	.....	.....	.....	.85	1.95	2.45	2.15	1.16	1.26	2.8	1.48	1.45
7	.....	.....	.....	.85	1.82	2.5	2.0	1.12	1.19	2.7	1.48	1.42
8	.....	.8	.88	.86	1.78	2.35	1.96	1.19	1.14	2.6	1.45	1.40
9	.....	.....	.....	.86	1.70	2.25	1.91	1.24	1.11	2.5	1.45	1.40
10	.....	.....	.....	.86	1.62	2.2	1.84	1.16	1.11	2.4	1.45	1.38
11	.85	.....	.....	.91	1.56	2.0	1.70	1.15	1.22	2.65	1.42	1.38
12	.78	.....	.....	.92	1.62	1.95	2.1	1.15	1.21	2.55	1.40	1.35
13	.....	.....	.....	.99	1.68	1.92	2.25	1.15	1.15	2.3	1.40	1.32
14	.....	.....	.....	1.10	1.69	1.94	2.1	1.15	1.06	2.1	1.38	1.32
15	.....	.8	.88	1.38	1.84	1.90	1.94	1.12	1.02	2.0	1.36	1.31
16	.....	.....	.....	1.88	2.2	1.86	1.82	1.11	1.02	1.92	1.32	1.30
17	.....	.....	.....	2.40	2.25	1.85	1.75	1.09	1.00	1.81	1.30	1.29
18	.95	.....	.....	2.55	2.2	1.81	1.65	1.08	.98	1.74	1.30	1.28
19	.....	.....	.....	2.5	2.1	1.90	1.56	1.05	.95	1.69	1.31	1.24
20	.....	.....	.....	2.4	1.96	2.0	1.56	1.06	1.04	1.69	1.36	1.22
21	.....	.....	.....	2.35	2.2	1.92	1.51	1.52	1.08	1.59	1.41	1.21
22	.....	.82	.88	2.4	2.6	1.84	1.45	1.54	1.06	1.56	1.49	1.51
23	.....	.....	.....	2.6	2.55	1.78	1.39	1.40	1.06	1.54	1.56	1.18
24	.....	.....	.....	2.9	2.4	1.69	1.34	1.35	1.11	1.50	1.32	1.12
25	.92	.....	.....	3.0	2.2	1.62	1.32	1.22	1.36	1.54	1.49	1.05
26	.....	.....	.....	2.8	2.1	1.56	1.32	1.14	1.51	1.71	1.42	1.11
27	.....	.....	.....	2.55	2.05	1.75	1.32	1.09	1.42	1.78	1.36	1.15
28	.....	.....	.....	2.3	2.0	2.05	1.29	1.12	1.31	1.69	1.31	1.15
29	.....	.....	.85	2.2	2.0	1.96	1.25	1.26	1.19	1.62	1.50	1.19
30	.....	.....	.....	2.15	2.0	1.84	1.21	1.21	.....	1.58	1.62	1.19
31	.....	.....	.....	.....	1.99	.....	1.34	1.16	.....	1.56	.....	1.16

NOTE.—Discharge relation affected by ice about Jan. 1 to Mar. 31. Gage height Dec. 22 apparently too high.

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Daily discharge, in second-feet, of Poplar River at Lutsen, Minn., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	19	168	139	100	70	34	33	78	99
2	19	150	148	83	58	32	34	73	97
3	19	150	150	71	50	30	32	71	92
4	19	159	150	65	47	32	39	67	72
5	19	150	150	132	40	47	280	66	67
6	19	141	252	179	35	44	360	70	66
7	19	119	265	150	32	37	325	70	62
8	19	113	228	143	37	33	295	66	60
9	19	100	202	134	42	31	265	66	60
10	19	89	190	122	35	31	240	66	58
11	20	80	150	100	34	40	310	62	58
12	21	89	141	168	34	39	280	60	54
13	24	97	136	202	34	34	215	60	50
14	30	99	139	168	34	28	168	58	50
15	58	122	132	139	32	26	150	55	49
16	129	190	126	119	31	25	136	50	48
17	240	202	124	108	29	24	118	48	47
18	280	190	118	98	29	23	106	48	46
19	265	168	132	80	27	22	99	49	42
20	240	143	150	80	28	26	99	55	40
21	228	190	136	73	75	29	85	61	39
22	240	295	122	66	78	28	80	71	a 38
23	295	280	113	59	60	28	78	80	36
24	395	240	99	53	54	31	72	50	32
25	430	190	89	50	40	55	78	71	27
26	360	168	80	50	33	73	102	62	31
27	280	159	106	50	29	62	113	55	34
28	215	150	159	47	32	49	99	49	34
29	190	150	146	43	44	37	89	72	37
30	179	150	122	39	39	a 35	83	89	37
31	.....	148	.....	53	35	.....	80	.....	35

a Interpolated.

NOTE.—Discharge computed from a fairly well defined rating curve.

Discharge estimated, because of ice, from gage heights, two discharge measurements, observer's notes, and climatologic records, as follows:

Jan. 1 to 31, 10 second-feet; Feb. 1 to 28, 9 second-feet; Mar. 1 to 31, 8 second-feet.

Monthly discharge of Poplar River at Lutsen, Minn., for 1913.

[Drainage area, 144 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	.....	.....	10	0.069	0.08	C.
February	.....	.....	9	.062	.06	C.
March	.....	.....	8	.056	.06	C.
April	430	19	144	1.00	1.12	B.
May	295	80	156	1.08	1.24	A.
June	265	80	147	1.02	1.14	A.
July	202	39	97.4	.676	.78	A.
August	78	27	41.2	.286	.33	B.
September	73	22	35.5	.247	.28	A.
October	360	32	147	1.02	1.18	B.
November	89	48	63.3	.440	.49	B.
December	99	27	51.5	.358	.41	B.
The year	430	.....	76.0	.528	7.17	

NOTE.—See footnote to table of daily discharge.

BEAVER BAY RIVER AT BEAVER BAY, MINN.

Location.—At bridge at Beaver Bay, a few hundred yards above mouth of river.

Records available.—July 26, 1911, to December 31, 1913.

Drainage area.—120 square miles.

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Gage.—Chain gage on steel highway bridge, April 22, 1912, at same section and datum as staff gage used July 26, 1911, to April 9, 1912. Gage read once daily to quarter-tenths. Limits of use: Hundredths below 2.0, half-tenths from 2.0 to 3.0, and tenths above 3.0 feet.

Control.—Permanent; solid rock.

Winter flow.—Affected by ice. Measurements made to determine winter discharge.

Regulation.—None.

Accuracy.—At times of exceptionally high sea on Lake Superior a bar is formed which causes backwater at the gage, lasting as long as the high sea is running. When the lake becomes normal the water washes through the bar and the regular rating curve applies. The discharge rating curve used for 1913 differs above 87 second-feet (gage height 2.0 feet) from that used for 1912. The rating curve for 1913 applies to 1912, and estimates of discharge for that year as published in Water-Supply Paper 324 should be revised to new rating curve, which gives the smaller discharge. The maximum difference between the two curves is about 10 per cent and occurs at gage height 2.6 feet.

Discharge measurements of Beaver Bay River at Beaver Bay, Minn., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Jan. 14[a]	S. B. Soulé	0.47	2.1
June 11[b]	do	2.66	189
11[c]	do	2.65	188

[a] Complete ice cover at gage bridged across the stream, not touching the water surface.
[b] Measurement made from a boat at a section about 700 feet below gage.
[c] Measurement made from a boat at a section about 200 feet below gage.

Daily gage height, in feet, of Beaver Bay River at Beaver Bay, Minn., for 1913.

[Louis Lorntson, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	.....	2.8	2.95	1.75	1.98	0.92	1.42	1.97	2.35
2	2.0	.....	.....	.....	2.9	3.0	1.50	1.73	.82	1.44	1.77	2.3
3	.....	.....	.....	2.8	3.0	2.8	1.35	1.43	.90	1.47	1.72	2.2
4	.....	.....	.....	2.9	2.9	2.6	1.50	1.33	1.50	3.2	1.67	2.0
5	.....	.....	.....	3.1	2.8	4.0	2.65	1.03	1.77	4.6	1.87	1.9
6	.....	−0.30	−0.18	2.3	2.7	4.7	2.8	1.01	1.72	4.2	1.77	1.87
7	.....	.....	.....	2.5	2.5	4.8	2.4	1.03	1.97	4.0	1.72	1.82
8	.....	.....	.....	1.92	2.4	4.0	2.5	1.03	1.77	3.9	1.92	2.7
9	.68	.....	.....	1.50	2.3	3.7	2.6	.98	1.42	3.7	1.72	2.45
10	.....	.....	.....	1.15	2.2	2.9	.....	1.08	2.25	5.4	1.92	1.67
11	.....	.....	.....	2.0	2.0	2.6	.....	1.13	2.7	4.9	2.25	1.62
12	.....	.....	.....	3.0	2.2	2.4	.....	1.38	2.45	4.3	1.7	1.52
13	.....	−.50	.15	3.5	2.25	2.2	.....	1.43	2.1	3.9	1.57	1.37
14	.47	.....	.....	4.1	2.25	2.2	.....	1.33	2.1	3.5	1.42	1.32
15	.....	.....	.....	5.5	3.2	2.2	2.65	1.23	1.72	3.3	1.32	1.27
16	.58	.....	.....	6.7	3.5	1.98	2.8	1.13	1.52	2.9	1.32	1.22
17	.....	.....	.....	7.0	3.3	1.90	2.9	.98	1.30	2.5	1.37	1.17
18	.....	.....	.....	7.0	2.9	1.70	2.7	1.13	1.12	2.2	1.42	1.12
19	.....	.....	.....	5.9	2.65	2.3	2.3	1.13	.92	1.95	1.47	1.17
20	.....	−.10	.15	5.2	2.7	2.6	2.2	1.53	1.12	2.0	1.62	1.42
21	.....	.....	.....	5.0	4.6	2.3	1.98	1.55	1.72	2.05	1.82	1.92
22	.....	.....	.....	4.9	4.7	2.2	2.1	2.2	1.62	1.95	1.92	1.82
23	.10	.....	.....	4.9	4.2	1.90	1.88	2.35	1.32	1.9	2.05	1.42
24	.....	.....	.....	5.2	3.5	1.82	1.65	1.73	1.42	1.9	1.97	1.22
25	.....	.....	.....	5.0	3.2	1.65	1.48	1.33	1.97	1.9	2.0	.97
26	.....	.....	.....	3.8	2.8	1.80	1.48	1.08	2.25	2.5	1.92	1.67
27	.....	−.60	.38	3.5	2.6	2.05	1.48	1.03	2.1	2.3	1.87	1.57
28	.....	.....	.....	3.2	2.55	2.4	1.73	1.13	2.05	1.95	1.77	.....
29	.....	.....	.....	2.95	2.4	2.25	1.38	1.05	1.95	2.15	1.82	1.67
30	.02	.....	.....	2.8	2.5	1.98	1.28	1.05	1.62	2.0	1.97	.....
31	.....	.....	.....	.....	3.0	.....	2.15	1.03	.....	1.75	.....	1.17

NOTE.—Discharge relation affected by ice Jan. 1 to about Apr. 5, and about Dec. 26–31.

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Daily discharge, in second-feet, of Beaver Bay River at Beaver Bay, Minn., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	230	270	63	85	19	39	84	132
2	.....	255	285	44	61	16	40	65	124
3	.....	285	230	36	40	18	42	61	110
4	.....	255	180	44	34	44	350	57	87
5	.....	230	675	192	22	65	945	74	77
6	124	205	990	230	21	61	765	65	74
7	160	160	1,040	140	22	84	675	61	69
8	79	140	675	160	22	65	630	79	205
9	44	124	545	180	20	39	545	61	150
10	27	110	255	180	24	117	1,350	79	75
11	87	87	180	180	26	205	1,080	117	53
12	285	110	140	190	37	150	810	59	45
13	465	117	110	190	40	98	630	49	36
14	720	117	110	190	34	98	465	39	34
15	1,350	350	110	192	30	61	385	34	32
16	1,890	465	85	230	26	45	255	34	30
17	2,020	385	77	255	20	33	160	36	28
18	2,020	255	59	205	26	26	110	39	26
19	1,530	192	124	124	26	19	82	42	28
20	1,220	205	180	110	46	26	87	53	39
21	1,120	945	124	85	48	61	92	69	79
22	1,080	990	110	98	110	53	82	79	69
23	1,080	765	77	75	182	34	77	92	39
24	1,220	465	69	55	61	39	77	84	30
25	1,120	350	55	43	34	34	77	87	20
26	585	230	67	43	24	117	160	79	20
27	465	180	92	43	22	98	124	74	20
28	350	170	140	61	26	92	82	65	20
29	270	140	117	37	23	82	104	69	20
30	230	160	85	32	23	53	87	84	20
31	.....	285	.....	104	22	.....	63	.....	20

NOTE.—Discharge computed from a rating curve well defined below 285 second-feet (gage height 3.0 feet) and poorly defined above that point. Discharge July 10–14 estimated. Discharge estimated, because of ice, from gage heights, one discharge measurement, observer's notes, climatologic records, and discharge of adjacent areas, as follows: Jan. 1–31, 3 second-feet; Feb. 1–28, 1 second-foot; Mar. 1–31, 2 second-feet, varying from about 1 to 4 second-feet; Apr. 1–5, 50 second-feet; Dec. 26–31, 20 second-feet. See "Accuracy" in station description.

Monthly discharge of Beaver Bay River at Beaver Bay, Minn., for 1913.

[Drainage area, 120 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	.....	.....	a 3	0.025	0.03	C.
February	.....	.....	a 1	.0083	.009	C.
March	.....	.....	a 2	.017	.02	C.
April	2,020	27	660	5.50	6.14	C.
May	990	87	289	2.41	2.78	B.
June	1,040	55	242	2.02	2.25	B.
July	255	32	123	1.02	1.18	B.
August	132	20	38.3	.319	.37	A.
September	205	16	66.7	.556	.62	A.
October	1,800	39	336	2.80	3.23	B.
November	117	34	65.7	.548	.61	A.
December	205	.....	57.8	.482	.56	B.
The year	2,020	.....	157	1.31	17.80	

a Estimated.

NOTE.—See footnote to table of daily discharge.

ST. LOUIS RIVER NEAR THOMSON, MINN.

Location.—In sec. 11, T. 48 N., R. 16 W., just below tailrace of the Great Northern power house, 3 miles east of Thomson.

Records available.—October 5, 1909, to December 31, 1913.

Drainage area.—3,420 square miles.

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Gage.—Chain gage read four times each day (except Sunday), at 8 and 11 a. m., 2 and 5 p. m.; average of four readings taken as the mean for the day. Limits of use: Hundredths below 0.0, half-tenths from 0.0 to 1.5, and tenths above 1.5 feet.

Control.—Practically permanent at low stages; at high stages may shift slightly.

Discharge measurements.—Made from cable 1,500 feet below gage.

Winter flow.—During January, February, and March ice renders the gage heights useless as indication of discharge. Flow for these months estimated from amount of water passing through turbines of Great Northern Power Co.

Regulation.—The flow at the station is to a certain extent regulated by reservoirs above. The dam at Thomson is designed to hold 24 hours' supply of water for the power plant, and logging dams control the discharge from a large part of the entire area above the station. Gage heights show considerable fluctuations caused by operation of turbine gates at power plant, which is operated on a 24-hour schedule though with varying load.

Accuracy.—Open-water estimates subject to errors due to fluctuation in stage caused by operation of power plant. Daily range in stage is not great, however, and it is believed that errors will compensate for a month, so that the monthly averages should be accurate within 10 per cent. Accuracy of records furnished by the power company not known.

Cooperation.—Gage heights throughout the year and records of flow when ice affects discharge relation furnished through courtesy of Great Northern Power Co., Duluth.

Discharge measurements of St. Louis River near Thomson, Minn., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 16	S. B. Soulé	3.32	4,130
Sept. 9	B. J. Peterson	2.18	2,350

Daily gage height, in feet, of St. Louis River near Thomson, Minn., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.4	4.7	4.2	3.5	2.6	.....	1.7	1.8	1.7
2	.55	4.3	3.4	3.0	2.7	.....	1.5	1.9	1.7
3	.7	4.1	3.5	3.1	2.3	.....	1.6	2.1	1.8
4	.75	4.6	4.0	2.9	2.3	.....	1.5	2.2	1.7
5	1.2	3.9	3.7	3.6	2.0	.....	2.7	2.1	1.8
6	1.5	3.9	4.4	4.2	2.0	.....	.....	2.0	1.6
7	1.8	3.3	5.5	4.4	1.6	.....	4.0	1.9	1.6
8	2.0	.....	5.0	3.5	1.7	2.3	4.2	2.0	1.1
9	2.2	3.2	5.5	3.3	1.8	2.6	4.7	1.8	.....
10	2.2	3.6	4.6	3.0	1.7	2.5	4.7	1.7	1.1
11	2.1	3.5	4.6	2.8	1.7	2.7	4.9	1.8	1.35
12	2.2	2.8	4.4	3.2	1.8	2.5	4.7	1.6	1.25
13	2.4	2.5	4.1	3.8	1.5	2.6	4.4	1.5	1.25
14	2.8	2.7	3.8	4.7	1.5	2.5	4.5	1.45	1.15
15	3.0	3.3	3.8	4.3	1.4	2.5	4.1	1.8	1.1
16	3.2	3.1	3.3	4.0	.....	2.1	3.9	1.5	1.1
17	3.6	4.1	2.9	5.1	.....	1.9	3.9	1.5	.95
18	3.5	5.3	2.6	5.9	1.68	1.8	3.4	1.35	.8
19	3.5	4.5	2.6	5.9	1.3	1.8	3.2	1.6	.75
20	3.4	4.5	2.8	5.6	1.3	1.5	2.8	1.4	.6
21	3.4	5.4	2.9	5.0	1.3	1.4	2.7	1.45	.4
22	3.5	5.7	2.8	4.7	1.2	.....	2.4	1.4	.6
23	3.9	5.9	3.3	4.2	1.2	1.2	2.2	1.8	.65
24	3.9	5.1	2.5	3.8	1.2	1.2	2.4	1.8	.6
25	5.5	5.5	2.8	3.5	1.3	1.2	2.3	1.8	.4
26	5.6	4.6	2.8	3.1	1.5	1.6	2.4	1.6	.4
27	5.4	4.7	2.9	3.3	.....	1.6	2.4	1.8	.35
28	5.4	3.9	3.8	3.4	.....	1.7	2.4	1.6	.....
29	5.8	5.2	3.7	3.0	.....	1.7	2.3	1.7	.5
30	5.2	3.8	3.1	3.1	.....	1.8	2.3	1.7	.6
31	.....	4.1	.....	2.7	.....	.....	1.8	.....	.6

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Daily discharge, in second-feet, of St. Louis River near Thomson, Minn., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	335	350	370	530	7,080	5,910	4,440	2,910	.....	1,720	1,830	1,720
2	328	346	366	635	6,140	4,260	3,540	3,060	.....	1,500	1,950	1,720
3	367	317	354	740	5,090	4,440	3,710	2,480	.....	1,610	2,200	1,830
4	373	326	366	780	6,840	5,470	3,380	2,480	.....	1,500	2,340	1,720
5	356	318	337	1,180	5,260	4,840	4,640	2,070	.....	3,060	2,200	1,830
6	344	311	373	1,500	5,260	6,370	5,910	2,070	.....	[1]4,260	2,070	1,610
7	324	340	375	1,830	4,060	9,150	6,370	1,610	.....	5,470	1,950	1,610
8	328	323	377	2,070	a3,970	7,850	4,440	1,720	2,480	5,910	2,070	1,090
9	290	360	374	2,340	3,880	9,150	4,060	1,830	2,910	7,080	1,830	a1,090
10	310	330	345	2,340	4,640	6,840	3,540	1,720	2,760	7,080	1,720	1,090
11	315	346	353	2,200	4,440	6,840	3,220	1,720	3,060	7,590	1,830	1,340
12	218	358	317	2,340	3,220	6,370	3,880	1,830	2,760	7,080	1,610	1,220
13	327	354	351	2,620	2,760	5,690	5,050	1,500	2,910	6,370	1,500	1,220
14	326	366	332	3,220	3,060	5,050	7,080	1,500	2,760	6,600	1,440	1,140
15	328	388	355	3,540	4,060	5,050	6,140	1,390	2,760	5,690	1,830	1,090
16	336	408	392	3,880	3,710	4,060	5,470	a1,490	2,200	5,260	1,500	1,090
17	332	402	321	4,640	5,690	3,380	8,110	a1,600	1,950	5,260	1,500	955
18	348	411	339	4,440	8,530	2,910	10,200	1,700	1,830	4,250	1,340	820
19	345	426	338	4,440	6,600	2,910	10,200	1,280	1,830	3,880	1,610	780
20	336	449	340	4,250	6,600	3,220	9,410	1,280	1,500	3,220	1,390	670
21	362	488	338	4,250	8,890	3,380	7,850	1,280	1,390	3,060	1,440	530
22	332	461	301	4,440	9,670	3,220	7,080	1,180	1,280	2,620	1,390	670
23	304	449	351	5,260	10,200	4,060	5,910	1,180	1,180	2,340	1,830	705
24	315	439	342	5,260	8,110	2,760	5,050	1,180	1,180	2,620	1,830	670
25	304	409	303	9,150	9,150	3,220	4,440	1,280	1,180	2,480	1,830	530
26	324	371	332	9,410	6,840	3,220	3,710	1,500	1,610	2,620	1,610	530
27	335	342	313	8,890	7,080	3,380	4,060	.....	1,610	2,620	1,830	500
28	347	378	316	8,890	5,260	5,050	4,250	.....	1,720	2,620	1,610	a550
29	338	.....	327	9,930	8,370	4,840	3,540	.....	1,720	2,480	1,720	600
30	347	.....	393	8,370	5,050	3,710	3,710	.....	1,830	2,480	1,720	670
31	338	.....	389	.....	5,690	.....	3,060	.....	.....	1,830	.....	670

a Discharge interpolated.

NOTE.—Daily discharge computed from a rating curve well defined between 530 and 10,400 second-feet (gage heights 0.4 and 6.0 feet). Discharge Jan. 1 to Mar. 31, furnished by the Great Northern Power Co. Discharge Aug. 27 to Sept. 7, estimated by comparison with rainfall records as follows: Aug. 27–31, 1,500 second-feet; Sept. 1–7, 1,800 second-feet.

Monthly discharge of St. Louis River near Thomson, Minn., for 1913.

[Drainage area, 3,420 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	373	218	329	0.096	0.11	
February	488	311	377	.110	.11	
March	393	301	348	.102	.12	
April	9,930	530	4,050	1.18	1.32	B.
May	10,200	2,760	6,000	1.75	2.02	B.
June	9,150	2,760	4,890	1.43	1.60	B.
July	10,200	3,060	5,340	1.56	1.80	B.
August	3,060	1,180	1,690	.494	.57	B.
September	3,060	1,180	1,970	.576	.64	B.
October	7,590	1,500	3,940	1.15	1.33	A.
November	2,340	1,340	1,750	.512	.57	A.
December	1,830	500	1,040	.304	.35	B.
The year	10,200	218	2,660	.778	10.54	

NOTE.—See footnote to table of daily discharge.

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WHITEFACE RIVER BELOW MEADOWLANDS, MINN.

Location.—About 2½ miles below gaging station on Whiteface River at Meadowlands, half a mile below the beginning of decided rapids, and about 10 miles above confluence of Whiteface and St. Louis rivers.

Records available.—April 28, 1912, to December 31, 1913.

Drainage area.—446 square miles.

Gage.—Chain gage attached to two trees on left bank read daily, morning and evening, to quarter-tenths. Limits of use: Half-tenths below 3.5 and tenths above 3.5 feet.

Control.—Heavy gravel and rocks; probably permanent.

Discharge measurements.—Made by wading or from the highway bridge in sec. 14, T. 53 N., R. 19 W., near the gage of the abandoned station on Whiteface River at Meadowlands.

Winter flow.—Affected by ice; observations discontinued.

Regulation.—The flow is controlled to a large extent by logging dams above. The operation of gates at these dams causes fluctuations in gage heights amounting to several feet at the gage section. Few logs lodge below the station, so that backwater from logs is seldom present.

Accuracy.—Estimates good except as affected by ice.

Discharge measurements of Whiteface River below Meadowlands, Minn., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
June 4	W. G. Hoyt	4.42	825
Sept. 11	B. J. Peterson	4.19	694

Daily gage height, in feet, of Whiteface River below Meadowlands, Minn., for 1913.

[A. A. Jochim, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3.7	4.2	3.8	3.3	2.4	3.15	3.7	3.0
2	.....	4.0	4.0	3.6	3.25	2.45	3.15	3.35	3.0
3	.....	4.0	4.4	3.4	3.2	2.35	3.15	3.3	3.05
4	.....	4.0	4.2	3.35	3.1	3.8	3.6	3.2	3.05
5	.....	4.0	4.2	4.0	3.0	4.6	4.4	3.15	3.0
6	.....	3.3	5.9	4.6	2.9	4.5	4.9	3.2	2.95
7	.....	3.8	6.2	4.7	2.85	4.4	5.1	3.2	2.9
8	.....	3.9	6.1	4.7	2.85	4.2	5.2	3.15	3.2
9	.....	4.0	6.1	4.4	2.8	4.0	5.1	3.0	.....
10	.....	2.45	6.5	4.2	2.8	3.8	5.2	3.2	.....
11	Ice.	2.4	6.1	4.1	2.8	4.2	5.5	3.5	.....
12	.....	3.1	5.9	4.3	2.75	4.0	5.3	3.3	.....
13	2.5	3.6	4.9	4.5	2.8	3.9	5.1	3.15	.....
14	2.5	3.0	4.4	4.5	2.8	3.8	5.0	3.1	.....
15	2.4	2.7	4.4	4.4	2.75	3.6	4.8	3.05	.....
16	2.7	4.1	4.2	4.9	2.75	3.5	4.5	2.8	.....
17	3.2	4.9	4.0	5.3	2.8	3.35	4.3	2.8	.....
18	3.7	4.8	3.8	5.2	2.8	3.25	4.1	2.8	.....
19	4.0	5.0	3.7	5.0	2.75	3.15	3.9	2.9	.....
20	4.1	5.0	3.8	4.8	2.75	3.1	3.8	3.2	.....
21	4.1	5.0	3.7	4.6	2.7	3.05	3.6	2.95	.....
22	3.9	5.7	3.6	4.4	2.7	2.9	3.5	3.1	.....
23	3.8	5.2	3.5	4.2	2.8	2.85	3.5	2.95	.....
24	4.0	5.2	3.35	4.0	2.8	2.9	3.4	2.8	.....
25	4.5	4.8	3.3	3.8	2.8	3.0	3.35	2.95	.....
26	4.5	4.8	3.3	3.8	2.75	3.25	3.45	3.1	.....
27	4.8	4.6	3.7	3.7	2.7	3.25	3.6	3.0	.....
28	5.2	3.3	3.8	3.6	2.6	3.25	3.5	2.9	.....
29	4.4	3.3	3.8	3.5	2.6	3.2	3.4	2.95	.....
30	4.0	3.5	3.8	3.4	2.55	3.15	3.45	3.0	.....
31	.....	4.0	.....	3.35	2.6	.....	3.6	.....	.....

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Daily discharge, in second-feet, of Whiteface River below Meadowlands, Minn., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	474	712	519	316	97	266	474	220
2	.....	613	613	431	299	104	266	334	220
3	.....	613	816	352	282	92	266	316	235
4	.....	613	712	334	250	519	431	282	235
5	.....	613	712	613	220	932	816	266	220
6	.....	316	1,820	932	192	872	1,120	282	206
7	.....	519	2,050	992	180	816	1,250	282	192
8	.....	565	1,980	992	180	712	1,320	266	.....
9	.....	613	1,980	816	167	613	1,250	220	.....
10	.....	104	2,280	712	167	519	1,320	282	.....
11	.....	97	1,980	662	167	712	1,530	390	.....
12	.....	250	1,820	763	156	613	1,390	316	.....
13	110	431	1,120	872	167	565	1,250	266	.....
14	110	220	816	872	167	519	1,180	250	.....
15	97	145	816	816	156	431	1,050	235	.....
16	145	662	712	1,120	156	390	872	167	.....
17	282	1,120	613	1,390	167	334	763	167	.....
18	474	1,050	519	1,320	167	299	662	167	.....
19	613	1,180	474	1,180	156	206	565	192	.....
20	662	1,180	519	1,050	156	250	519	282	.....
21	662	1,180	474	932	145	235	431	206	.....
22	565	1,680	431	816	145	192	390	250	.....
23	519	1,320	390	712	167	180	390	206	.....
24	613	1,320	334	613	167	192	352	167	.....
25	872	1,050	316	519	167	220	334	206	.....
26	872	1,050	316	519	156	299	371	250	.....
27	1,050	932	474	474	145	299	431	220	.....
28	1,320	316	519	431	126	299	390	192	.....
29	816	316	519	390	126	282	352	206	.....
30	613	390	519	352	118	266	371	220	.....
31	.....	613	.....	334	126	.....	431	.....	.....

NOTE.—Discharge computed from a well-defined rating curve. Discharge Dec. 8 to 31 estimated, because of ice, from gage heights, observer's notes, climatologic records and discharge of adjacent drainage areas, as 200 second-feet, varying from about 150 to 250 second-feet.

Monthly discharge of Whiteface River below Meadowlands, Minn., for 1913.

[Drainage area, 446 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
April (13-30)	1,320	97	578	1.30	0.87	B.
May	1,680	97	695	1.56	1.80	B.
June	2,280	316	912	2.04	2.28	B.
July	1,390	334	736	1.65	1.90	B.
August	316	118	176	.395	.46	B.
September	932	92	404	.906	1.01	B.
October	1,530	266	720	1.61	1.86	B.
November	474	167	252	.565	.63	B.
December	.....	.....	204	.457	.53	D.

CLOQUET RIVER AT INDEPENDENCE, MINN.

Location.—In sec. 26, T. 52 N., R. 17 W., at highway bridge at Independence post office, just below a small tributary entering from the north.

Records available.—June 28, 1909, to December 31, 1913.

Drainage area.—698 square miles.

Gage.—Vertical staff, read daily, morning, noon, and evening to quarter-tenths. Limits of use: Hundredths below 4.0, half-tenths from 4.0 to 6.0, and tenths above 6.0 feet.

Control.—Practically permanent except when obstructed by log jams.

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Discharge measurements.—Made from bridge.

Winter flow.—Affected by ice. From January 1 to April 19 the monthly mean has been based on the discharge at the outlet of Fish Lake reservoir on Cloquet River, in sec. 15, T. 52 N., R. 15 W., and from Island Lake reservoir on Beaver River, in sec. 29, T. 52 N., R. 15 W., plus 10 second-feet.

Regulation.—Cloquet River is used extensively for log driving, and the run-off from by far the greater part of the drainage area above Independence is controlled by logging dams. This control causes violent fluctuations in the gage height during the day, amounting at times to several feet, and consequently the mean daily gage height, which is the mean of the three readings per day, can only be considered approximate. The chief purpose of the records is to show the approximate mean monthly discharge and total discharge.

Accuracy.—Discharge relation at the gage section affected by backwater from a log jam just below the highway bridge, April 20 to June 30, 1913. Winter records good. For open-water accuracy see note under "Regulation."

Cooperation.—Records of flow from logging reservoirs January 1 to March 31, 1913, furnished by Great Northern Power Co., of Duluth.

Discharge measurements of Cloquet River at Independence, Minn., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
June 4	W. G. Hoyt	6.58	849
Sept. 10	B. J. Peterson	6.00	906

Daily gage height, in feet, of Cloquet River at Independence, Minn., for 1913.

[Herbert Haakensen, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	7.3	5.2	7.5	6.5	4.6	4.5	5.2	4.95
2	.....	5.45	5.0	6.6	5.35	4.6	4.55	5.4	4.65
3	.....	7.7	7.6	6.6	5.3	4.55	4.6	5.5	4.4
4	.....	6.1	6.6	7.0	5.0	4.5	4.75	5.5	5.1
5	.....	7.9	7.6	6.2	5.0	4.75	5.0	5.3	5.0
6	.....	5.9	7.4	5.65	5.25	4.9	5.4	5.2	4.9
7	.....	7.3	7.1	5.45	5.5	4.6	6.7	5.05	4.9
8	.....	5.85	6.9	5.3	5.65	4.6	6.0	5.35	4.85
9	.....	7.5	6.4	4.8	5.55	5.9	7.3	6.2	5.15
10	.....	7.7	7.6	4.6	5.3	5.9	7.3	6.5	5.4
11	.....	5.7	7.4	5.1	5.25	5.9	7.2	5.15	5.2
12	.....	5.35	6.6	5.1	5.3	5.8	7.2	4.5	5.4
13	.....	6.2	7.5	5.5	5.05	5.95	7.2	4.5	5.6
14	.....	7.7	7.5	6.6	5.3	6.0	7.1	4.5	5.4
15	.....	5.25	7.8	6.0	6.6	5.9	6.8	4.5	5.4
16	.....	5.2	6.9	5.6	6.2	5.9	6.9	4.6	5.3
17	.....	7.8	5.6	6.3	5.6	5.8	6.8	4.6	5.2
18	.....	6.5	4.8	6.2	4.9	5.8	6.9	4.6	5.0
19	.....	5.6	6.3	6.2	4.85	5.75	5.8	4.65	5.0
20	4.1	6.6	7.7	6.3	4.7	5.7	5.75	4.7	4.95
21	4.3	7.9	7.3	6.2	4.5	5.65	5.6	4.9	5.1
22	5.05	8.2	7.6	5.9	4.4	5.4	5.6	4.9	5.35
23	5.05	7.8	6.4	6.1	4.35	5.0	5.6	5.0	5.45
24	6.8	6.2	7.3	5.8	4.8	4.8	5.7	5.0	5.45
25	7.2	6.1	8.4	5.35	5.3	4.75	5.8	5.0	5.6
26	6.8	7.5	7.9	6.2	5.1	4.6	5.85	4.8	5.7
27	6.2	6.4	8.0	6.6	5.4	4.55	5.9	4.7	5.8
28	8.3	7.3	7.8	6.3	5.5	4.5	5.7	4.7	.....
29	8.4	6.3	5.0	6.1	4.85	4.5	5.5	4.9	.....
30	7.9	6.5	7.5	5.1	4.55	4.5	5.2	4.9	.....
31	.....	8.3	.....	5.35	4.5	.....	5.2	.....	.....

NOTE.—Discharge relation affected by backwater from log jam about Apr. 20 to June 30, and by ice about Dec. 21–31.

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Daily discharge, in second-feet, of Cloquet River at Independence, Minn., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1,380	262	2,670	1,370	193	165	410	311
2	.....	337	208	1,480	480	193	179	505	208
3	.....	1,680	1,600	1,480	455	179	193	560	140
4	.....	580	865	1,980	330	165	240	560	370
5	.....	1,840	1,600	1,080	330	240	330	455	330
6	.....	495	1,450	652	432	292	505	410	292
7	.....	1,380	1,220	532	560	193	1,600	350	292
8	.....	475	1,080	455	652	193	900	480	274
9	.....	1,520	740	257	590	825	2,390	1,080	390
10	.....	1,680	1,600	193	455	825	2,390	1,370	505
11	.....	420	1,450	370	432	825	2,250	390	410
12	.....	307	865	370	455	755	2,250	165	505
13	.....	630	1,520	560	350	862	2,250	165	620
14	.....	1,680	1,520	1,480	455	900	2,110	165	505
15	.....	277	1,760	900	1,480	825	1,720	165	505
16	.....	262	1,080	620	1,080	825	1,850	193	455
17	.....	1,760	385	1,170	620	755	1,720	193	410
18	.....	800	162	1,080	292	755	1,850	193	330
19	.....	385	685	1,080	274	720	755	208	330
20	64	865	1,680	1,170	224	685	720	224	311
21	82	1,840	1,380	1,080	165	652	620	292	.....
22	248	2,080	1,600	825	140	505	620	292	.....
23	221	1,760	740	985	129	330	620	330	.....
24	1,000	630	1,380	755	257	257	685	330	.....
25	1,300	580	2,240	480	455	240	755	330	.....
26	1,000	1,520	1,840	1,080	370	193	790	257	.....
27	630	740	1,920	1,480	505	179	825	224	.....
28	2,160	1,380	1,760	1,170	560	165	685	224	.....
29	2,240	685	208	985	274	165	560	292	.....
30	1,840	800	1,520	370	179	165	410	292	.....
31	.....	2,160	.....	480	165	.....	410	.....	.....

NOTE.—Discharge Dec. 21–31 estimated, because of ice, from gage heights, observer's notes, climatologic records and discharge of adjacent drainage areas, at 300 second-feet. See "Winter flow" and "Accuracy" in station description.

Monthly discharge of Cloquet River at Independence, Minn., for 1913.

[Drainage area, 698 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	.....	.....	a 156	0.223	0.26	
February	.....	.....	a 205	.294	.31	
March	.....	.....	a 119	.170	.20	
April	2,240	.....	398	.570	.64	D.
May	2,160	262	1,060	1.52	1.75	C.
June	2,240	162	1,210	1.73	1.93	B.
July	2,670	193	944	1.35	1.56	B.
August	1,480	129	468	.670	.77	A.
September	900	165	469	.672	.75	A.
October	2,390	165	1,080	1.55	1.79	A.
November	1,370	165	370	.530	.59	A.
December	.....	140	348	.499	.58	B.
The year	2,670	.....	571	.818	11.13	

a Estimated.

NOTE.—See footnote to table of daily discharge.

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STREAMS TRIBUTARY TO LAKE MICHIGAN.

ESCANABA RIVER NEAR ESCANABA, MICH.

Location.—At highway bridge between Escanaba and Gladstone, Mich., about 9 miles north of Escanaba and 4 miles above mouth of River, T. 40 N., R. 23 W., at quarter-section corner between secs. 24 and 25.

Records available.—August 25, 1903, to March 31, 1909; June 1, 1909, to December 31, 1913. Discharge measurements only April, May, and July, 1903.

Drainage area.—800 square miles.

Gage.—Standard chain attached to bridge; new gage installed November 15, 1910. Gage read once daily in the morning to tenths.

Control.—Probably permanent.

Discharge measurements.—Made from downstream side of bridge.

Winter flow.—Affected by ice, which exists some years for nearly four months.

Accuracy.—Discharge relation during the logging season affected by backwater from log jams. All gage readings for 1913 are correct if the new chain (installed Nov. 15, 1910) has not stretched and if the structure to which the gage is attached has not changed since July 16, 1908.

No discharge measurements were made at this station during 1913.

Daily gage height, in feet, of Escanaba River near Escanaba, Mich., for 1913.

[Olive Beauchamp, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	4.8	5.2	3.3	3.3	2.4	2.1	2.8	3.0	3.0
2	4.1	.....	.....	4.9	4.8	3.2	2.9	2.5	2.1	2.7	2.9	3.1
3	.....	.....	.....	5.0	4.3	3.2	2.8	2.5	2.2	2.9	2.9	3.1
4	.....	.....	.....	5.2	4.2	3.2	2.8	2.4	2.5	3.0	2.8	2.9
5	.....	.....	.....	5.2	4.4	3.3	3.0	2.4	2.5	3.1	2.8	2.9
6	.....	3.6	3.6	5.2	4.6	3.7	3.0	2.3	2.4	3.1	2.7	2.9
7	.....	.....	.....	5.3	4.4	3.5	3.0	2.3	2.4	3.1	2.7	2.8
8	.....	.....	.....	5.3	4.4	3.5	2.9	2.4	2.4	3.1	2.7	2.7
9	3.7	.....	.....	5.3	4.1	3.4	2.8	2.5	2.4	3.2	2.7	2.7
10	.....	.....	.....	5.2	3.9	3.4	2.8	2.5	2.2	3.2	2.8	2.7
11	.....	.....	.....	5.2	3.6	3.2	2.5	2.4	2.2	3.3	3.0	2.9
12	.....	.....	.....	5.2	3.6	3.1	3.3	2.4	2.1	3.3	3.0	2.9
13	.....	3.6	3.6	5.2	3.6	2.9	3.3	2.3	2.1	3.5	2.9	2.4
14	.....	.....	.....	5.4	3.6	2.9	3.2	2.2	2.1	3.6	2.8	2.4
15	.....	.....	.....	5.4	3.4	2.9	3.0	2.2	2.1	3.3	2.8	2.3
16	3.7	.....	.....	5.4	3.4	2.8	2.9	2.1	2.1	3.3	2.7	2.3
17	.....	.....	.....	5.5	3.5	2.8	2.8	2.1	2.0	2.9	2.7	2.4
18	.....	.....	.....	5.6	3.5	2.8	2.7	2.1	2.0	2.9	2.8	2.4
19	.....	.....	.....	6.0	3.7	3.7	2.5	2.1	2.0	2.8	2.8	2.4
20	.....	3.6	4.4	6.1	3.7	3.3	2.5	2.1	2.0	2.7	3.0	2.4
21	.....	.....	.....	6.2	3.7	3.7	2.5	2.1	2.5	2.7	3.2	2.5
22	.....	.....	.....	6.2	3.9	3.7	2.3	2.1	3.3	2.7	3.4	2.6
23	3.8	.....	.....	5.8	3.9	3.5	2.4	2.1	3.5	2.7	3.5	2.7
24	.....	.....	.....	6.4	3.9	3.3	2.4	2.1	3.5	2.6	3.7	2.5
25	.....	.....	.....	6.8	3.7	2.9	2.4	2.0	3.4	2.6	3.7	2.6
26	.....	.....	.....	6.6	3.7	2.9	2.3	2.0	3.3	2.6	3.5	2.7
27	.....	3.6	4.4	6.4	3.5	3.1	2.3	2.0	3.3	2.9	3.4	2.7
28	.....	.....	.....	6.2	3.3	3.5	2.2	2.0	3.3	3.0	3.1	2.7
29	.....	.....	.....	5.8	3.2	3.5	2.2	2.0	3.3	3.3	3.0	2.7
30	3.8	.....	.....	5.6	3.2	3.4	2.2	2.1	3.0	3.2	3.0	2.7
31	.....	.....	.....	.....	3.2	.....	2.2	2.1	.....	3.0	.....	2.5

NOTE.—Discharge relation affected by ice about Jan. 1 to Mar. 31.

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MENOMINEE RIVER NEAR IRON MOUNTAIN, MICH.

Location.—At the homestead highway bridge, 3½ miles south of Iron Mountain, Mich.

Records available.—September 4, 1902, to March 31, 1909; June 5, 1909, to December 31, 1913.

Drainage area.—2,420 square miles.

Gage.—Standard chain gage attached to the bridge; read once daily to tenths. From September 4, 1902, to May 18, 1904, a staff gage was read.

Control.—Permanent.

Winter flow.—Prior to 1914 few discharge measurements had been made at Iron Mountain when ice was present. Information obtained from persons familiar with conditions in the vicinity of the gage led to the assumption that discharge relation was not affected by ice, but measurements made during 1914 show that this assumption was unwarranted.

Regulation.—Practically no reservoirs above gaging station. Fluctuations at the gage are, however, caused by operation of Peninsular Power Co.'s plant above station. Plant is run continuously, but load varies somewhat throughout the day, causing slight fluctuations in stage at the gage.

Accuracy.—As discharge relation may be affected by ice and possibly also by backwater from logs during certain periods, winter records previous to December 1, 1913, should be used with caution.

Cooperation.—Gage readings furnished by courtesy of Oliver Iron Mining Co.

Discharge measurements of Menominee River near Iron Mountain, Mich., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Oct. 2	S. B. Soulé	3.17	2,200
3	.....do	2.76	1,960

Daily gage height, in feet, of Menominee River near Iron Mountain, Mich., for 1913.

[A. J. St. Arnauld, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.0	1.8	2.1	3.1	8.8	4.3	2.0	2.4	2.2	2.4	4.0	3.6
2	2.0	1.8	2.1	2.8	8.0	6.7	1.0	2.4	2.2	2.8	4.0	3.8
3	2.0	1.8	2.0	2.8	7.8	3.2	1.8	2.6	2.0	3.0	3.4	3.2
4	1.8	1.8	1.9	2.8	7.6	4.8	2.8	2.6	2.0	2.8	2.8	3.0
5	2.0	1.8	1.9	2.8	7.5	4.8	4.8	2.4	2.0	3.5	1.6	2.9
6	2.1	2.0	1.7	3.1	9.5	5.0	4.8	0.9	2.0	3.5	1.9	2.4
7	2.1	2.2	1.7	3.1	5.5	7.6	4.6	2.0	2.1	4.2	2.0	3.0
8	2.2	2.2	1.7	3.4	6.1	7.6	4.6	2.7	2.1	1.6	2.0	2.4
9	2.5	2.0	1.7	4.1	5.5	7.4	4.2	2.8	2.1	1.9	2.0	1.9
10	2.5	2.0	1.7	5.5	5.6	5.5	4.0	2.8	2.0	3.6	2.0	3.0
11	2.7	2.0	1.7	5.0	5.0	5.5	3.4	2.8	2.1	3.6	1.8	3.0
12	2.7	2.0	1.6	4.8	4.4	5.4	3.7	2.8	2.0	4.0	2.0	3.0
13	2.5	1.9	1.6	5.1	4.0	5.4	3.9	2.6	2.0	4.0	2.3	3.0
14	1.7	1.2	1.4	5.5	4.2	5.0	3.9	2.6	2.8	4.0	2.5	2.8
15	2.3	1.6	1.3	6.1	5.1	5.0	3.4	2.4	2.8	4.0	2.5	2.8
16	2.3	1.9	1.3	7.3	4.2	3.6	3.2	2.4	2.8	3.8	2.5	3.0
17	2.3	1.9	1.3	9.2	6.5	3.6	4.0	2.2	2.8	2.2	2.6	3.0
18	2.2	1.9	1.5	10.6	9.0	3.3	3.8	2.2	2.8	2.4	2.6	3.0
19	2.1	1.9	1.7	12.0	7.9	4.0	3.6	2.2	3.0	2.4	2.9	3.0
20	2.1	1.9	2.0	11.0	9.3	5.5	3.4	2.0	3.0	2.8	2.9	3.0
21	2.1	1.9	2.0	10.6	9.3	5.5	3.0	1.7	4.4	2.8	2.9	3.0
22	2.1	1.4	2.3	10.6	6.7	5.0	3.0	1.7	4.6	2.6	2.9	2.4
23	2.0	1.4	2.0	10.6	6.0	5.0	2.8	1.7	4.8	2.6	3.0	2.4
24	2.0	1.4	2.0	12.3	6.0	5.0	2.8	1.7	4.8	2.8	3.0	2.4
25	2.0	1.6	1.8	10.8	6.2	4.8	2.8	1.7	4.8	2.8	4.8	2.4
26	2.0	1.9	1.8	11.9	6.0	3.7	2.8	1.8	5.0	4.8	4.8	2.4
27	1.9	1.9	1.8	11.6	5.3	3.2	2.6	1.7	5.1	4.8	4.8	2.4
28	2.1	2.1	2.0	11.2	6.0	1.1	2.5	1.7	3.0	4.6	4.6	2.4
29	2.0	.....	2.0	10.6	3.6	1.9	2.4	1.7	2.4	4.6	4.6	2.4
30	1.9	.....	2.6	9.0	4.0	2.9	2.4	1.7	2.4	4.6	4.6	2.4
31	1.9	.....	3.0	.....	4.3	.....	2.4	2.0	.....	4.6	.....	2.4

NOTE.—Apparently no backwater from ice during 1913.

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Daily discharge, in second-feet, of Menominee River near Iron Mountain, Mich., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,560	1,440	1,620	2,290	7,560	3,180	1,560	1,820	1,680	1,820	2,960	2,660
2	1,560	1,440	1,620	2,080	6,740	5,360	1,030	1,820	1,680	2,080	2,960	2,810
3	1,560	1,440	1,560	2,080	6,520	2,360	1,440	1,940	1,560	2,220	2,510	2,360
4	1,440	1,440	1,500	2,080	6,300	3,580	2,080	1,940	1,560	2,080	2,080	2,220
5	1,560	1,440	1,500	2,080	6,180	3,580	3,580	1,820	1,560	2,580	1,340	2,150
6	1,620	1,560	1,390	2,290	8,470	3,750	3,580	985	1,560	2,580	1,500	1,820
7	1,620	1,680	1,390	2,290	4,200	6,300	3,420	1,560	1,620	3,110	1,560	2,220
8	1,680	1,680	1,390	2,510	4,780	6,300	3,420	2,010	1,620	1,340	1,560	1,820
9	1,880	1,560	1,390	3,040	4,200	6,080	3,110	2,080	1,620	1,500	1,560	1,500
10	1,880	1,560	1,390	4,200	4,300	4,200	2,960	2,080	1,560	2,660	1,560	2,220
11	2,010	1,560	1,390	3,750	3,750	4,200	2,510	2,080	1,620	2,660	1,440	2,220
12	2,010	1,560	1,340	3,580	3,260	4,110	2,740	2,080	1,560	2,960	1,560	2,220
13	1,880	1,500	1,340	3,840	2,960	4,110	2,880	1,940	1,560	2,960	1,750	2,220
14	1,390	1,120	1,220	4,200	3,110	3,750	2,880	1,940	2,080	2,960	1,880	2,080
15	1,750	1,340	1,180	4,780	3,840	3,750	2,510	1,820	2,080	2,960	1,880	2,080
16	1,750	1,500	1,180	5,970	3,110	2,660	2,360	1,820	2,080	2,810	1,880	2,220
17	1,750	1,500	1,180	8,120	5,160	2,660	2,960	1,680	2,080	1,680	1,940	2,220
18	1,680	1,500	1,280	9,800	7,890	2,440	2,810	1,680	2,080	1,820	1,940	2,220
19	1,620	1,500	1,390	11,500	6,640	2,960	2,660	1,680	2,220	1,820	2,150	2,220
20	1,620	1,500	1,560	10,300	8,240	4,200	2,510	1,560	2,220	2,080	2,150	2,220
21	1,620	1,500	1,560	9,800	8,240	4,200	2,220	1,390	3,260	2,080	2,150	2,220
22	1,620	1,220	1,750	9,800	5,360	3,750	2,220	1,390	3,420	1,940	2,150	1,820
23	1,560	1,220	1,560	9,800	4,680	3,750	2,080	1,390	3,580	1,940	2,220	1,820
24	1,560	1,220	1,560	11,900	4,680	3,750	2,080	1,390	3,580	2,080	2,220	1,820
25	1,560	1,340	1,440	10,100	4,870	3,580	2,080	1,390	3,580	2,080	3,580	1,820
26	1,560	1,500	1,440	11,400	4,680	2,740	2,080	1,440	3,750	3,580	3,580	1,820
27	1,500	1,500	1,440	11,000	4,020	2,360	1,940	1,390	3,840	3,580	3,580	1,820
28	1,620	1,620	1,560	10,500	4,680	1,080	1,880	1,390	2,220	3,420	3,420	1,820
29	1,560	.....	1,560	9,800	2,660	1,500	1,820	1,390	1,820	3,420	3,420	1,820
30	1,500	.....	1,940	7,890	2,960	2,150	1,820	1,390	1,820	3,420	3,420	1,820
31	1,500	.....	2,220	.....	3,180	.....	1,820	1,560	.....	3,420	.....	1,820

NOTE.—Daily discharge determined from a well-defined rating curve.

Monthly discharge of Menominee River near Iron Mountain, Mich., for 1913.

[Drainage area, 2,420 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	2,010	1,390	1,640	0.678	0.78	C.
February	1,680	1,120	1,460	.603	.63	C.
March	2,220	1,180	1,480	.612	.71	C.
April	11,900	2,080	6,430	2.66	2.97	C.
May	8,470	2,660	5,070	2.10	2.42	B.
June	6,300	1,080	3,610	1.49	1.66	B.
July	3,580	1,030	2,420	1.00	1.15	B.
August	2,080	985	1,670	.690	.80	B.
September	3,840	1,560	2,220	.917	1.02	B.
October	3,580	1,340	2,500	1.03	1.19	B.
November	3,580	1,340	2,260	.934	1.04	B.
December	2,810	1,500	2,070	.855	.99	B.
The year	11,900	985	2,740	1.13	15.36	

WOLF RIVER AT KESHENA, WIS.

Location.—At highway bridge at Keshena, 3 miles below outlet of West Branch of Wolf River (coming in from the right).

Records available.—May 9, 1907, to March 31, 1909; February 10, 1911, to December 31, 1913.

Drainage area.—797 square miles.

Gage.—Vertical staff, read twice daily up to October 1, 1911; since that date read morning, noon, and evening; mean of three readings taken as mean for day. Limits of use: Hundredths below 0.5, half tenths from 0.5 to 1.5, and tenths above 1.5 feet.

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Control.—Gravel; smooth and permanent.

Discharge measurements.—Made from the bridge.

Winter flow.—Solid ice cover forms in the vicinity of gage and causes 1 to 3 feet of backwater. At times during the winter slush ice and frazil collect under this ice cover, making discharge measurements impossible. The ice forms at the falls above Keshena and floats in the river as backwater from the dam at Shawano.

Regulation.—River and main tributaries above Keshena controlled to some extent by logging dams.

Accuracy.—Conditions favorable; open-water rating curve excellent between gage heights 1 and 4 feet. Accuracy of open-water records depends on accuracy with which mean gage height is determined.

Cooperation.—Station maintained in cooperation with United States Indian Office and Wisconsin Railroad Commission.

Discharge measurements of Wolf River at Keshena, Wis., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Jan. 28	W. G. Hoyt	4.4	[a] 537
Mar. 11	S. B. Soulé	3.70	[b] 537
June 18	do	2.72	1,120
Sept. 29	do	2.20	837

[a] Measurement made under complete ice cover about 4 miles below gage.
[b] Complete ice cover at gage.

Daily gage height, in feet, of Wolf River at Keshena, Wis., for 1913.

[Ray Gauthier, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	3.9	4.0	3.4	3.5	2.6	2.8	.....	2.3	2.2	1.8
2	.....	4.4	4.0	4.0	3.4	3.6	2.6	2.6	1.8	2.2	2.3	2.1
3	.....	.....	.....	4.4	3.4	3.5	2.5	2.5	2.5	2.3	2.4	2.0
4	.....	4.2	.....	4.5	3.4	3.4	2.6	2.4	2.5	2.2	2.2	1.7
5	4.8	.....	3.8	4.6	3.3	3.1	2.7	2.2	2.3	2.2	2.1	1.5
6	.....	4.0	.....	4.6	3.5	3.0	2.6	2.2	2.0	2.1	2.2	1.5
7	5.0	.....	.....	4.5	3.8	3.0	2.7	2.2	2.0	2.2	2.2	1.3
8	.....	4.0	3.7	4.2	4.0	2.9	2.7	2.3	2.1	2.5	2.2	1.3
9	5.0	4.0	3.8	3.9	4.4	2.7	2.8	2.4	2.1	2.7	2.6	1.4
10	.....	.....	.....	3.7	3.9	2.6	2.9	2.4	1.9	2.9	2.8	1.3
11	5.0	3.9	3.7	3.7	3.6	2.6	2.8	2.3	1.8	3.3	2.6	1.2
12	5.3	.....	3.7	3.6	3.2	2.6	2.9	2.2	1.8	3.0	2.7	1.5
13	.....	.....	.....	3.6	3.2	2.6	3.0	2.2	1.7	2.8	2.6	1.8
14	5.4	.....	.....	3.6	3.2	2.6	3.0	2.1	1.7	2.6	2.4	1.7
15	.....	3.8	3.7	3.6	3.1	2.7	2.7	2.0	1.7	2.5	2.4	1.6
16	5.2	.....	.....	3.8	3.0	2.7	2.6	2.0	1.7	2.4	2.3	1.7
17	.....	3.8	4.4	3.9	2.9	2.7	2.7	2.0	1.8	2.2	2.2	1.4
18	5.3	.....	.....	4.1	2.8	2.8	2.7	2.1	1.9	2.2	2.2	1.6
19	5.2	3.8	4.3	4.4	2.7	2.9	2.5	2.1	1.9	2.2	2.1	1.8
20	.....	.....	.....	4.4	2.6	3.1	2.5	2.0	2.2	2.2	1.9	1.8
21	4.8	.....	.....	4.5	2.6	3.0	2.6	2.0	3.1	2.3	2.0	1.9
22	.....	.....	.....	4.1	2.7	2.9	2.3	2.0	3.0	2.4	2.0	2.0
23	4.9	3.8	.....	4.1	2.8	2.8	2.3	2.0	2.8	2.2	1.8	2.1
24	.....	3.8	4.0	4.1	2.7	2.7	2.3	1.8	2.6	2.1	1.9	2.6
25	4.8	.....	.....	4.1	2.6	2.8	2.2	1.7	2.9	2.2	2.0	2.7
26	4.8	.....	4.0	4.3	2.6	2.9	2.3	1.7	2.9	2.3	1.7	2.8
27	.....	3.8	.....	4.2	2.7	2.8	2.2	1.6	2.8	2.6	1.6	2.9
28	4.5	.....	.....	3.9	2.8	2.7	2.3	.....	2.6	2.7	1.4	2.9
29	.....	.....	3.9	3.7	3.2	2.6	2.9	.....	2.4	2.6	1.4	3.0
30	4.5	.....	.....	3.7	3.6	2.7	3.0	.....	2.3	2.4	1.2	3.2
31	.....	.....	.....	.....	3.6	.....	3.0	.....	.....	2.3	.....	3.4

NOTE.—Discharge relation affected by ice about Jan. 1 to Mar. 31, Nov. 9–18, and Dec. 18–31.

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Daily discharge, in second-feet, of Wolf River at Keshena, Wis., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,920	1,530	1,590	1,060	1,170	660	915	869	695
2	1,920	1,530	1,660	1,060	1,060	695	869	915	824
3	2,190	1,530	1,590	1,010	1,010	1,010	915	962	780
4	2,260	1,530	1,530	1,060	962	1,010	869	869	654
5	2,330	1,460	1,340	1,110	869	915	869	824	575
6	2,330	1,590	1,280	1,060	869	780	824	869	575
7	2,260	1,790	1,280	1,110	869	780	869	869	497
8	2,060	1,920	1,220	1,110	915	824	1,010	869	497
9	1,850	2,190	1,110	1,170	962	824	1,110	.....	536
10	1,720	1,850	1,060	1,220	962	737	1,220	.....	497
11	1,720	1,660	1,060	1,170	915	695	1,460	.....	459
12	1,660	1,400	1,060	1,220	869	695	1,280	.....	575
13	1,660	1,400	1,060	1,280	869	654	1,170	.....	695
14	1,660	1,400	1,060	1,280	824	654	1,060	.....	654
15	1,660	1,340	1,110	1,110	780	654	1,010	.....	614
16	1,790	1,280	1,110	1,060	780	654	962	.....	654
17	1,850	1,220	1,110	1,110	780	695	869	.....	536
18	1,990	1,170	1,170	1,110	824	737	869	.....	.....
19	2,190	1,110	1,220	1,010	824	737	869	824	.....
20	2,190	1,060	1,340	1,010	780	869	869	737	.....
21	2,260	1,060	1,280	1,060	780	1,340	915	780	.....
22	1,990	1,110	1,220	915	780	1,280	962	780	.....
23	1,990	1,170	1,170	915	780	1,170	869	695	.....
24	1,990	1,110	1,110	915	695	1,060	824	737	.....
25	1,990	1,060	1,170	869	654	1,220	869	780	.....
26	2,120	1,060	1,220	915	654	1,220	915	654	.....
27	2,060	1,110	1,170	869	614	1,170	1,060	614	.....
28	1,850	1,170	1,110	915	630	1,060	1,110	536	.....
29	1,720	1,400	1,060	1,220	640	962	1,060	536	.....
30	1,720	1,660	1,110	1,280	660	915	962	459	.....
31	.....	1,660	.....	1,280	670	.....	915	.....	.....

NOTE.—Discharge computed from a rating curve well defined between 383 and 1,920 second-feet (gage heights, 1.0 and 4.0 feet). Discharge estimated, because of ice, from gage heights, two discharge measurements, observer's notes, climatologic records, and flow of West Branch of Wolf River at Neopit, as follows: Jan. 1–31, 630 second-feet; Feb. 1–28, 560 second-feet; Mar. 1–31, 720 second-feet; Nov. 9–18, 850 second-feet; and Dec. 18–31, 480 second-feet.

Monthly discharge of Wolf River at Keshena, Wis., for 1913.

[Drainage area, 797 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	.....	.....	630	0.790	0.91	C.
February	.....	.....	560	.703	.73	C.
March	.....	.....	720	.903	1.04	C.
April	2,330	1,660	1,960	2.46	2.74	A.
May	2,190	1,060	1,400	1.76	2.03	A.
June	1,660	1,060	1,220	1.53	1.71	A.
July	1,280	869	1,080	1.36	1.57	A.
August	1,170	614	821	1.03	1.19	A.
September	1,340	654	890	1.12	1.25	A.
October	1,460	824	979	1.23	1.42	A.
November	.....	459	789	.990	1.10	B.
December	.....	.....	550	.690	.80	C.
The year	2,330	.....	968	1.21	16.49	

NOTE.—See footnote to table of daily discharge.

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WEST BRANCH OF WOLF RIVER AT NEOPIT, WIS.

Location.—At the dam and power plant at Neopit, a station of the Wisconsin & Northern Railroad, 20 miles north of Shawano.

Records available.—January 25, 1911, to December 31, 1913.

Drainage area.—108 square miles.

Gages.—Vertical staff gages on headrace and tailrace.

Determination of flow.—An attempt in 1911 to measure the flow by current meter a short distance below the dam proved unsatisfactory, and it was decided to rate the turbine and spillway. The power is developed by means of a timber dam about 14 feet high, which backs the water upstream for a considerable distance and forms a service reservoir. The spillway is a rectangular opening about 13 feet wide, which is closed by means of stop planks. Little water leaks through the dam, but considerable passes between the planks when all are in place. The power house is at the dam and is equipped with a 35-inch Leffel-Samson turbine, belted to a 60-kilowatt generator, which is used chiefly for lighting. The turbine takes water from the service reservoir through a rectangular flume, which is 9 feet wide by 6 feet deep and is lined with smooth planks. The turbine was rated by means of current-meter measurements in the flume. The spillway and leakage through the boards were rated by measurements in the sluiceway. Gages were placed in the pond and below the dam to show the head on the turbine. Readings of both gages, voltage, amperage, and number of planks removed from the spillway were recorded seven times each day, at 6, 7, and 10 a. m., 12 m., 3, 6, and 10 p. m. These readings were then weighted in accordance with the elapsed interval.

Accuracy.—Seven current-meter measurements made during 1913 indicate careful observations and results well within 10 per cent. When the station was visited September 30 and October 1, 1913, it was found that an obstruction under the fourth stop plank of spillway caused a leakage of about 41 second-feet. This obstruction occurred either July 27 or September 3, 1913; 41 second-feet have been added to the computed discharge from September 3 to October 1, but as it is possible that the obstruction may have occurred on July 27, estimates of daily discharge may be 41 second-feet too low from that date to September 2.

Cooperation.—Station established at request of United States Indian Office, as Neopit is on Menominee Indian Reservation.

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Daily discharge, in second-feet, of West Branch of Wolf River at Neopit, Wis., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	159	111	107	228	163	178	170	147	127	83	179	131
2	113	126	112	209	151	210	139	138	122	136	63	205
3	136	120	122	217	81	197	187	117	286	135	82	152
4	125	106	105	245	246	179	171	133	130	102	135	86
5	96	107	117	229	189	161	180	136	115	216	148	72
6	120	106	108	191	224	221	177	131	120	133	265	66
7	117	103	116	155	113	144	184	130	168	98	120	52
8	109	102	114	172	252	116	153	130	178	79	161	64
9	109	89	133	188	229	104	191	142	119	180	141	78
10	139	109	109	151	146	167	128	147	107	208	39	78
11	129	107	129	176	210	201	126	103	106	171	74	186
12	128	108	115	158	117	124	259	85	112	186	164	110
13	113	107	128	190	194	125	201	136	158	143	99	110
14	112	108	207	179	141	303	135	135	159	199	142	117
15	128	107	184	205	260	349	139	209	163	87	111	119
16	120	116	195	197	298	378	141	159	159	121	149	130
17	130	116	136	204	259	180	172	174	157	137	81	171
18	114	106	160	235	160	156	163	145	157	134	105	83
19	143	107	148	199	200	275	154	159	155	127	177	62
20	119	104	162	150	145	255	127	139	158	140	125	69
21	112	103	156	121	165	196	135	138	.....	139	209	72
22	139	95	141	165	220	173	137	134	.....	136	188	77
23	108	101	177	140	142	127	137	127	.....	130	73	81
24	*1* 120	110	149	154	170	165	134	137	.....	135	248	106
25	*1* 120	107	135	149	166	197	132	122	.....	136	80	132
26	126	114	137	209	101	202	134	111	.....	188	109	130
27	104	104	131	64	260	204	223	117	.....	199	142	130
28	104	132	136	256	191	165	267	120	228	138	128	109
29	114	.....	142	78	242	178	191	123	138	188	133	102
30	115	.....	193	85	243	170	147	135	178	140	101	70
31	115	.....	184	.....	211	.....	117	110	.....	168	.....	72

Monthly discharge of West Branch of Wolf River at Neopit, Wis., for 1913.

[Drainage area, 108 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	159	96	121	1.12	1.29	B.
February	132	89	108	1.00	1.04	B.
March	207	105	142	1.31	1.51	B.
April	256	64	177	1.64	1.83	B.
May	298	81	190	1.76	2.03	B.
June	378	104	193	1.79	2.00	B.
July	267	117	163	1.51	1.74	C.
August	209	85	134	1.24	1.43	(*b*)
September	286	106	152	1.41	1.57	C.
October	216	79	146	1.35	1.56	B.
November	265	39	132	1.22	1.36	B.
December	205	52	104	.963	1.11	B.
The year	378	39	147	1.36	18.47	

b See "Accuracy."

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GRAND RIVER AT GRAND RAPIDS, MICH.

Location.—At Fulton Street Bridge, Grand Rapids, Mich.
Records available.—March 12, 1901, to December 31, 1913.
Drainage area.—4,900 square miles.
Gage.—Staff, attached to bridge; read daily, morning and evening, to hundredths. Limits of use: Hundredths below 0.5 and tenths above 0.5 feet.
Discharge measurements.—Made from downstream side of bridge.
Winter flow.—Somewhat affected by ice.
Regulation.—Operation of power plants above station may modify low-water flow.
Accuracy.—The two or three measurements made at this station since 1905 indicate that the 1905 discharge curve is not applicable after that year.
Cooperation.—Records furnished by city engineer of Grand Rapids.

No discharge measurements were made at this station during 1913.

Daily gage height, in feet, of Grand River at Grand Rapids, Mich., for 1913.

[A. J. Seys and Charles Darling, observers.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	6.3	2.8	8.7	1.4	.....	−1.70	−1.80	.....	−1.68	−1.45	−0.3
2	0.0	.....	.....	8.4	1.2	−0.3	−1.70	−1.80	−1.45	−1.30	.....	.0
3	.2	8.2	3.0	8.6	1.0	− .3	−1.80	.....	−1.80	−1.25	−1.62	− .3
4	−.2	8.4	2.6	9.2	.....	− .4	.....	−1.80	−1.95	−1.28	−1.48	− .5
5	.....	8.4	2.4	9.6	.2	− .55	−1.80	−1.80	−2.00	.....	−1.45	− .2
6	−.70	8.4	2.4	.....	.6	− .80	.....	−1.85	−2.00	−1.42	−1.55	− .2
7	−.75	8.1	2.2	11.7	.3	− .80	−1.80	−1.90	.....	−1.30	−1.62	.....
8	−.4	7.8	2.2	11.7	.0	.....	−1.80	−2.00	−2.00	−1.40	−1.50	− .3
9	−.1	.....	.....	10.8	− .2	− .90	−1.80	−2.00	−2.20	−1.45	.....	.0
10	.1	7.2	3.6	10.0	− .5	− .95	−1.80	.....	−2.20	−1.45	−1.52	− .3
11	.4	6.5	5.3	9.0	.....	−1.05	−1.90	−1.95	−2.20	−1.48	−1.55	− .60
12	.....	6.0	7.0	8.2	− .80	−1.20	−1.90	−1.65	−2.20	.....	−1.48	− .70
13	.8	6.0	9.7	.....	− .60	−1.30	.....	−1.40	−2.20	−1.52	−1.40	− .82
14	.6	5.6	9.8	7.2	− .5	−1.35	−1.90	−1.45	.....	−1.48	−1.45	.....
15	.6	4.6	10.6	6.7	− .60	.....	−1.90	−1.55	−2.10	−1.55	−1.40	−1.15
16	1.0	.....	.....	5.7	− .5	−1.50	−1.90	−1.40	−2.20	−1.52	.....	−1.05
17	2.0	4.0	11.2	5.1	.2	−1.50	−1.50	.....	−2.20	−1.55	−1.45	−1.05
18	4.2	3.8	10.7	4.5	.....	−1.50	−1.20	−1.00	−2.00	−1.48	− .90	− .98
19	.....	3.3	9.7	3.9	.6	−1.60	− .90	− .2	−1.90	.....	− .58	−1.10
20	5.6	3.5	8.7	.....	.7	−1.55	.....	− .2	−1.80	−1.55	.2	−1.05
21	5.8	4.0	8.2	2.8	.9	−1.50	−1.00	− .55	.....	−1.50	.2	.....
22	5.5	.....	8.0	2.4	.6	.....	−1.20	− .9	−1.70	−1.32	.3	−1.15
23	5.8	.....	.....	2.2	.2	−1.50	−1.00	−1.15	−1.70	−1.35	.....	−1.00
24	5.8	3.9	8.8	1.6	− .2	−1.60	−1.20	.....	−1.70	−1.48	.0	−1.08
25	5.8	3.7	9.3	1.5	.....	−1.70	−1.70	−1.45	−1.70	−1.60	.0	.....
26	.....	3.7	10.0	1.7	− .2	−1.55	−1.70	−1.80	−1.70	.....	− .2	−1.15
27	5.7	3.7	10.6	.....	− .2	−1.50	.....	−1.90	−1.68	−1.62	.....	−1.00
28	5.4	3.2	10.8	1.6	− .2	−1.60	−1.90	−1.85	.....	−1.58	− .5	.....
29	4.9	.....	10.4	1.8	.0	.....	−1.90	−1.95	−1.68	−1.45	− .4	−1.00
30	.....	.....	.....	1.7	.....	−1.65	−1.80	−1.80	−1.65	−1.35	.....	−1.10
31	5.6	.....	9.1	.....	− .1	.....	−1.80	.....	.....	−1.40	.....	−1.18

NOTE.—Observer made no notes concerning ice. Discharge relation not materially affected by ice during 1913.

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MANISTEE RIVER NEAR SHERMAN, MICH.

Location.—At north bridge, 1 mile from Sherman, Mich., immediately above mouth of Wheeler Creek.

Records available.—July 10, 1903, to December 31, 1913.

Drainage area.—900 square miles.

Gage.—Standard chain gage, read daily, morning and evening, to hundredths. Limits of use: Tenths throughout the entire range in stage during 1913.

Control.—Probably permanent.

Discharge measurements.—Made from downstream side of bridge.

Winter flow.—Special studies are necessary to determine the winter flow, as the stream freezes over. The constancy of flow is remarkable and is due to the fact that the supply is derived from springs and ground water. The maximum recorded mean flow for any month from 1903 to 1908 is only two and one-half times the minimum recorded flow. Consequently a fairly close estimate of the discharge for the periods during which ice is present can be made by using climatological data and the observer's notes.

Accuracy.—Rating curve for 1913 well defined by numerous discharge measurements made by the Fargo Engineering Co., of Jackson, Mich. The new rating curve, which differs from that used prior to 1913 mainly above gage height 3.0 feet, gives the larger discharge, the percentage difference increasing with the stage from about 2½ per cent at gage height 3.0 feet to about 7½ per cent at gage height 6.0 feet. Discharge measurements made by the Fargo Engineering Co. during November and December, 1912, but not available before the publication of Water-Supply Paper No. 324, indicate that the new rating curve is applicable for 1912, and estimates of discharge as published for that year should be revised by those using them. At times the discharge relation may be affected by backwater from log jams.

Cooperation.—Station maintained in cooperation with William G. Fargo.

Discharge measurements of Manistee River near Sherman, Mich., in 1912–13.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
1912.		*Feet.*	*Sec.-ft.*	1913.		*Feet.*	*Sec.-ft.*
Nov. 19	Tefft[a] and Aronson[a]	3.36	1,500	Mar. 25	Kephart[a] and Smits[a]	6.99	[c] 2,740
Dec. 3	Aronson[a] and Snyder[a]	3.74	1,790	26	do	6.26	[c] 2,640
7	Aronson[a] and Martin[a]	3.54	1,600	Apr. 2	do	4.91	2,230
9	do	3.20	1,470	3	do	5.12	2,360
10	do	3.05	1,470	4	do	5.34	2,490
11	do	3.00	1,390	5	do	5.50	2,590
14	do	2.64	1,430	9	do	4.53	2,080
				15	Kephart[a] and Calkins[a]	4.24	1,860
1913.				17	Kephart[a] and Smits[a]	3.95	1,690
Jan. 18	Kephart[a] and Smits[a]	3.39	1,540	23	do	3.54	1,450
19	do	3.18	1,410	May 13	Spring[a]	3.00	1,280
20	do	3.02	1,310	31	do	2.90	1,250
Mar. 17	Kephart,[a] Bahr,[a] and Burnett[a]	4.50	[b] 1,550	June 25	do	2.45	1,070
				July 25	do	2.29	982
17	do	4.40	[b] 1,450	Aug. 28	do	2.08	908
24	Kephart[a] and Smits[a]	5.88	2,400				

[a] Engineer of the Fargo Engineering Co., Jackson, Mich.
[b] Velocity determined by use of floats.
[c] Doubtful; meter out of order.

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Daily gage height, in feet, of Manistee River near Sherman, Mich., for 1913.

[Margaret Munn, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.7	2.6	2.7	4.8	3.3	2.8	2.5	2.4	2.2	2.2	2.6	2.9
2	2.6	2.4	.....	5.0	3.3	2.8	2.5	2.4	2.1	2.5	2.6	2.9
3	2.6	2.4	2.6	5.1	3.2	2.8	2.5	2.4	2.1	2.6	2.6	2.9
4	2.6	2.3	2.5	5.3	3.1	2.7	2.5	2.4	2.1	2.6	2.6	2.8
5	2.5	1.9	2.5	5.5	3.0	2.7	2.6	2.4	2.1	2.5	2.6	2.8
6	2.5	1.7	2.4	5.5	3.2	2.6	2.6	2.4	2.2	2.4	2.5	2.8
7	2.5	2.6	2.3	5.2	3.3	2.7	2.6	2.3	2.1	2.4	2.5	2.7
8	2.6	3.9	2.5	4.8	3.3	2.7	2.5	2.3	2.1	2.4	2.6	2.7
9	2.3	3.2	2.6	4.6	3.2	2.8	2.4	2.4	2.1	2.4	2.5	2.7
10	2.4	3.2	2.6	4.4	3.1	2.7	2.4	2.4	2.1	2.4	2.5	2.7
11	2.7	3.4	2.7	4.4	3.0	2.6	2.3	2.4	2.1	2.6	2.5	2.7
12	2.8	2.9	2.8	4.5	3.0	2.6	2.3	2.3	2.1	2.7	2.5	2.7
13	2.4	2.8	3.0	4.5	3.0	2.5	2.4	2.2	2.1	2.6	2.5	2.7
14	2.4	3.0	4.9	4.4	3.0	2.5	2.3	2.2	2.1	2.6	2.6	2.7
15	2.5	3.0	6.2	4.3	3.2	2.5	2.3	2.4	2.1	2.6	2.6	2.7
16	2.7	2.8	5.5	4.1	3.2	2.4	2.3	2.4	2.2	2.6	2.6	2.7
17	3.1	2.7	4.4	4.0	3.2	2.4	2.3	2.3	2.4	2.8	2.6	2.6
18	3.4	2.8	4.0	3.9	3.1	2.4	2.5	2.3	2.6	3.0	2.6	2.6
19	3.2	2.8	4.2	3.8	2.9	2.4	2.5	2.3	2.6	3.1	2.9	2.6
20	3.0	2.9	4.7	3.7	2.9	2.6	2.4	2.2	2.5	3.0	3.7	2.6
21	2.8	3.0	4.9	3.6	3.3	2.8	2.3	2.2	2.5	2.9	3.8	2.5
22	2.6	2.9	5.1	3.6	3.5	2.7	2.3	2.2	2.5	2.8	3.7	2.5
23	2.7	2.5	4.9	3.5	3.6	2.6	2.3	2.2	2.5	2.8	3.7	2.4
24	2.8	2.4	6.1	3.5	3.6	2.5	2.3	2.2	2.4	2.8	3.6	2.4
25	2.6	2.3	7.0	3.5	3.4	2.5	2.2	2.1	2.3	2.8	3.4	2.4
26	2.7	2.6	6.3	3.6	3.3	2.6	2.2	2.1	2.3	2.7	3.2	2.3
27	2.7	2.8	5.5	3.7	3.2	2.6	2.5	2.1	2.3	2.7	3.0	2.1
28	2.5	2.8	5.0	3.7	3.1	2.6	2.6	2.1	2.2	2.7	3.0	2.2
29	2.4	.....	4.6	3.6	3.0	2.6	2.4	2.1	2.2	2.7	2.9	2.5
30	2.5	.....	4.4	3.5	2.9	2.6	2.4	2.1	2.2	2.7	2.9	2.4
31	2.7	.....	4.7	.....	2.9	.....	2.4	2.1	.....	2.7	.....	2.4

NOTE.—River partly frozen over at gage Feb. 6 and 9; control open. Discharge relation probably affected by ice about Feb. 7 to Mar. 6.

Daily discharge, in second-feet, of Manistee River near Sherman, Mich., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,160	1,110	.....	2,170	1,420	1,260	1,070	1,030	955	955	1,110	1,240
2	1,110	1,030	.....	2,290	1,420	1,200	1,070	1,030	919	1,070	1,110	1,240
3	1,110	1,030	.....	2,340	1,370	1,200	1,070	1,030	919	1,110	1,110	1,240
4	1,110	993	.....	2,460	1,330	1,160	1,070	1,030	919	1,110	1,110	1,200
5	1,070	852	.....	2,580	1,280	1,160	1,110	1,030	919	1,070	1,110	1,200
6	1,070	789	.....	2,580	1,370	1,110	1,110	1,030	955	1,030	1,070	1,200
7	1,070	.....	993	2,400	1,420	1,160	1,110	993	919	1,030	1,070	1,160
8	1,110	.....	1,070	2,170	1,420	1,160	1,070	993	919	1,030	1,110	1,160
9	993	.....	1,110	2,060	1,370	1,200	1,030	1,030	919	1,030	1,070	1,160
10	1,030	.....	1,110	1,950	1,330	1,160	1,030	1,030	919	1,030	1,070	1,160
11	1,160	.....	1,160	1,950	1,280	1,110	993	1,030	919	1,110	1,070	1,160
12	1,200	.....	1,200	2,010	1,280	1,110	993	993	919	1,160	1,070	1,160
13	1,030	.....	1,280	2,010	1,280	1,070	1,030	955	919	1,110	1,070	1,160
14	1,030	.....	2,230	1,950	1,280	1,070	993	955	919	1,110	1,110	1,160
15	1,070	.....	3,010	1,900	1,370	1,070	993	1,030	919	1,110	1,110	1,160
16	1,160	.....	2,580	1,800	1,370	1,030	993	1,030	955	1,110	1,110	1,160
17	1,330	.....	1,950	1,750	1,370	1,030	993	993	1,030	1,200	1,110	1,110
18	1,460	.....	1,750	1,700	1,330	1,030	1,070	993	1,110	1,280	1,110	1,110
19	1,370	.....	1,850	1,650	1,240	1,030	1,070	993	1,110	1,330	1,240	1,110
20	1,280	.....	2,120	1,600	1,240	1,110	1,030	955	1,070	1,280	1,600	1,110
21	1,200	.....	2,230	1,560	1,420	1,200	993	955	1,070	1,240	1,650	1,070
22	1,110	.....	2,340	1,560	1,510	1,160	993	955	1,070	1,200	1,600	1,070
23	1,160	.....	2,230	1,510	1,560	1,110	993	955	1,070	1,200	1,600	1,030
24	1,200	.....	2,950	1,510	1,560	1,070	993	955	1,030	1,200	1,560	1,030
25	1,110	.....	3,500	1,510	1,460	1,070	955	919	993	1,200	1,460	1,030
26	1,160	.....	3,070	1,560	1,420	1,110	955	919	993	1,160	1,370	955
27	1,160	.....	2,580	1,600	1,370	1,110	1,070	919	993	1,160	1,280	919
28	1,070	.....	2,290	1,600	1,330	1,110	1,110	919	955	1,160	1,280	955
29	1,030	.....	2,060	1,560	1,280	1,110	1,030	919	955	1,160	1,240	1,070
30	1,070	.....	1,950	1,510	1,240	1,110	1,030	919	955	1,160	1,240	1,030
31	1,160	.....	2,120	.....	1,240	.....	1,030	919	.....	1,160	.....	1,030

NOTE.—See "Accuracy" in station description. Discharge Feb. 7 to Mar. 6 estimated, because of ice, from gage heights, observer's notes, and climatologic records, 900 second-feet.

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Monthly discharge of Manistee River near Sherman, Mich., for 1913.

[Drainage area, 900 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	1,460	993	1,140	1.27	1.46	B.
February	.....	789	914	1.02	1.06	C.
March	3,500	.....	1,810	2.01	2.32	C.
April	2,580	1,510	1,890	2.10	2.34	A.
May	1,560	1,240	1,360	1.51	1.74	A.
June	1,200	1,030	1,120	1.24	1.38	A.
July	1,110	955	1,030	1.14	1.31	A.
August	1,030	919	981	1.09	1.26	A.
September	1,110	919	974	1.08	1.20	A.
October	1,330	955	1,140	1.27	1.46	A.
November	1,650	1,070	1,230	1.37	1.53	A.
December	1,240	919	1,110	1.23	1.42	B.
The year	3,500	789	1,230	1.37	18.48	

NOTE.—See footnote to table of daily discharge.

STREAMS TRIBUTARY TO LAKE HURON.

AU SABLE RIVER NEAR LOVELLS, MICH.

Location.—In the SE. ¼ sec. 1, T. 26 N., R. 1 W., about 900 feet below mouth of North Branch of Au Sable River, about 11 miles southeast of Lovells, and about 8 miles southwest of Red Oak post office, Mich.

Records available.—September 11, 1908, to December 31, 1913.

Drainage area.—1,000 square miles (determined by Fargo Engineering Co.).

Gage.—Vertical staff gage attached to overhanging tree on left bank used September 11, 1908, to March 23, 1913, when new vertical staff, bolted to a 1½-inch pipe driven 8 feet into the bed of the river, was installed about 7 feet upstream from old gage. Duplicate of new gage was later installed on right bank a short distance upstream. Sea-level elevation of zeros of the gages, 1,004.69 feet. Gage is read morning and evening to tenths. Limits of use: Tenths throughout the entire range in stage during 1908–1913.

Control.—Sand and gravel; practically permanent.

Discharge measurements.—Made from boat at section about 500 feet upstream from gage.

Winter flow.—Discharge relation affected by ice.

Accuracy.—Estimates for periods during which discharge relation was probably affected by ice are based on insufficient data and should be used with due caution. The ratios of the monthly and yearly discharges at Lovells to those at Bamfield for 1909–1913 is shown in the following table of monthly discharge. The close agreement between these ratios indicates that the estimates of discharge are good.

Cooperation.—Daily gage heights and numerous discharge measurements furnished by William G. Fargo, of Jackson, Mich., who established and maintains the stations.

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Discharge measurements of Au Sable River near Lovells, Mich., in 1908–1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
1908.		*Feet.*	*Sec. ft.*	1913.		*Feet.*	*Sec. ft.*
Sept. 11	C. E. Sawyer	0.50	647	Apr. 13	Gray and Angell	3.05	1,990
Oct. 9	do	.38	590	14	do	2.85	1,860
10	(a)	.39	625	14	do	2.85	1,940
Nov. 27	(a)	.95	959	15	do	2.65	1,720
				21	do	1.90	1,400
1909.				23	do	2.10	1,490
Jan. 5	(a)	0.50	760	24	do	2.25	1,570
27	(a)	1.14	1,050	26	do	2.37	1,590
Apr. 4	(a)	1.38	1,080	May 6	do	1.88	1,280
4	(a)	1.38	1,090	8	do	1.70	1,200
16	(a)	3.00	1,800	26	Gray and Redhead	1.50	1,180
16	(a)	3.00	1,760	28	do	1.25	1,080
				June 9	do	.99	929
1912.				13	do	.81	872
Sept. 20	P. S. Monk	1.12	1,080	24	do	.71	836
				July 14	Spring	.55	733
1913.				28	do	1.55	753
Apr. 12	Gray and Angell	3.05	2,050	Sept. 2	do	.40	662
12	do	3.05	2,010				

a Hydrographer's name not available.

NOTE.—Measurement on Sept. 20, 1912, made by U. S. Geological Survey; all other measurements furnished by Wm. G. Fargo.

Daily gage height, in feet, of Au Sable River near Lovells, Mich, for 1908–1913.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1908.					1908.				
1		0.6	0.4	0.6	16	0.5	0.4	0.4	0.6
2		.4	.3	.7	17	.4	.3	.4	.5
3		.4	.4	1.0	18	.4	.4	.4	.5
4		.4	.3	.8	19	.6	.2	.4	.5
5		.4	.4	.6	20	.6	.2	.4	.6
6		.4	.4	.6	21	.6	.3	.4	.4
7		.4	.5	.5	22	.3	.3	.4	.4
8		.4	.4	.5	23	.4	.3	.4	.6
9		.4	.4	.5	24	.4	.4	.6	.5
10		.4	.4	.4	25	.3	.6	.8	.6
11	0.5	.4	.3	.5	26	.2	.5	1.1	.5
12	.4	.4	.4	.5	27	.2	.4	.9	.4
13	.2	.4	.3	.4	28	.4	.4	.8	.4
14	.2	.4	.4	.5	29	.6	.4	.7	.2
15	.7	.4	.4	.5	30	.4	.4	1.0	.4
					31		.4		.4

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Daily gage height, in feet, of Au Sable River near Lovells, Mich., for 1908–1913—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	0.4	1.2	0.6	0.8	2.4	1.5	0.8	1.0	0.6	0.6	0.6	1.2
2	.7	1.1	.6	1.1	2.4	1.4	.8	.8	.6	.6	.7	1.0
3	.4	.6	.6	1.4	2.4	1.4	.8	.7	.6	.6	.7	1.0
4	.4	.6	.6	1.5	2.5	1.4	.8	.8	.6	.7	.7	.9
5	.5	.6	.5	2.2	2.6	1.2	.6	.8	.6	.6	.6	1.0
6	.4	.8	.5	3.0	2.6	1.2	.6	.8	.4	.6	.6	1.1
7	.4	.8	.5	3.0	2.5	1.4	.6	.7	.4	.4	.6	1.0
8	.7	.7	.6	3.0	2.4	1.4	.6	.7	.4	.4	.6	1.0
9	1.2	.8	.6	2.8	2.2	1.2	.6	.6	.4	.5	.6	1.0
10	.4	.8	.6	2.4	2.4	1.2	.6	.6	.5	.6	.6	1.0
11	.4	.6	.4	2.3	2.2	1.1	.6	.6	.5	.6	.6	.9
12	.6	.6	.5	2.8	2.1	1.2	.6	.6	.6	.4	.7	1.0
13	.8	.6	.6	3.4	1.9	1.0	.7	.6	.5	.6	.8	.8
14	1.2	.5	.6	3.2	2.0	1.4	.6	.6	.5	.6	.9	1.0
15	.4	.6	.5	3.0	2.2	1.4	.6	.6	.5	.6	.8	1.0
16	.6	.9	.6	2.9	2.4	1.2	.6	.6	.5	.7	.8	1.0
17	.8	.8	.6	2.7	2.6	1.4	.5	.6	.5	.9	.9	1.0
18	.4	.8	.5	2.6	2.6	1.5	.5	.6	.4	.8	1.0	1.0
19	.6	.7	.5	2.8	2.0	1.3	.5	.6	.4	.6	1.0	.8
20	.4	.6	.6	2.7	2.0	1.2	.4	.5	.4	.7	1.0	.9
21	.3	.6	.6	2.8	1.8	1.1	.6	.5	.4	.8	1.0	.8
22	.4	.6	.5	2.8	1.7	.9	.6	.5	.7	1.0	1.1	.9
23	.8	.6	.5	2.6	1.6	1.0	2.4	.4	.8	1.1	1.0	.9
24	1.2	.8	.6	2.3	1.6	1.0	2.0	.4	.7	1.0	.9	.8
25	1.3	.5	.7	2.2	1.5	1.0	1.8	.4	.7	.8	.8	.8
26	1.2	.6	.6	2.1	1.4	.8	1.5	.4	.6	.6	1.0	.8
27	1.2	.6	.8	2.2	1.4	.9	1.2	.4	.6	.7	1.0	.8
28	.9	.5	.8	2.2	1.7	.9	1.1	.5	.6	.7	1.2	.7
29	.8	.....	.8	2.2	1.7	.8	1.1	.6	.6	.6	1.3	.8
30	.6	.....	.7	2.2	1.6	.8	1.1	.5	.6	.6	1.3	1.2
31	.8	.....	.6	.....	1.6	.....	1.0	.6	.....	.6	.....	1.3
1910.												
1	.9	.5	.5	1.7	1.1	1.0	.3	.3	.4	.5	.8	.7
2	.8	.5	.5	1.6	1.1	1.0	.3	.3	.4	.5	.8	.6
3	.7	.5	.4	1.5	1.0	1.0	.3	.3	.4	.6	.9	.7
4	.5	.6	.5	1.4	1.0	.8	.3	.4	.4	.7	.8	.7
5	.6	.4	.6	1.4	.9	.9	.3	.3	.6	.8	.8	.7
6	.8	.6	.8	1.6	.9	.9	.3	.3	.8	.7	.6	.6
7	1.1	.6	1.0	1.6	.8	.8	.3	.4	.8	.8	.6	.8
8	1.2	.6	.8	1.5	.9	.8	.2	.3	.6	.7	.8	.8
9	1.4	.6	.8	1.4	.8	.8	.2	.3	.7	.6	.7	.8
10	1.8	.5	.7	1.4	.8	.7	.4	.4	.6	.6	.8	.9
11	1.2	.6	.8	1.4	.8	.7	.4	.4	.6	.6	.7	.8
12	.8	.6	.8	1.2	.7	.6	.4	.3	1.0	.6	.7	.6
13	.6	.5	.8	1.0	.7	.5	.6	.3	1.0	.5	.8	.6
14	.6	.4	.7	1.0	.7	.6	.5	.3	.9	.5	.7	.6
15	.8	.6	.7	1.0	.7	.6	.5	.4	.8	.5	.7	.6
16	.8	.6	.8	1.1	.7	.5	.4	.4	.8	.5	.6	.6
17	.8	.5	.8	1.3	.6	.6	.4	.5	.6	.5	.6	.6
18	.6	.6	.8	1.2	.8	.6	.4	.4	.7	.5	.6	.6
19	.6	.6	.6	1.2	.8	.6	.3	.3	.6	.5	.6	.5
20	.6	.6	2.0	1.1	.8	.7	.3	.3	.6	.5	.6	.4
21	.7	.5	2.2	1.1	.7	.6	.4	.3	.6	.6	.6	.6
22	.6	.5	2.6	1.0	.8	.6	.4	.3	.5	.7	.6	1.2
23	.8	.4	2.6	1.2	.8	.6	.4	.5	.5	.8	.6	.6
24	.8	.5	2.8	1.1	1.1	.5	.4	.4	.6	.7	.7	.5
25	.6	.5	2.8	1.1	1.1	.4	.4	.7	.6	.7	.8	.6
26	.6	.6	2.6	1.2	.8	.4	.4	1.0	.6	.6	.7	.7
27	.6	.7	2.6	1.4	.8	.4	.4	.8	.6	.8	.7	.6
28	.6	.6	2.3	1.3	.7	.4	.4	.8	.6	1.2	.8	.5
29	.6	.....	2.0	1.3	.8	.4	.3	.7	.5	1.0	.7	.5
30	.6	.....	2.0	1.2	.8	.4	.4	.6	.6	1.0	.7	.4
31	.5	.....	1.8	.....	1.0	.....	.4	.5	.....	.8	.....	.7

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Daily gage height, in feet, of Au Sable River near Lovells, Mich., for 1908–1913—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1911.												
1	0.6	0.4	0.4	01.5	02.0	01.9	0.8	0.6	0.6	1.0	1.4	1.6
2	.6	.5	.5	1.4	2.2	1.9	.8	.8	.6	1.1	1.2	1.6
3	.6	.5	.5	1.2	2.1	1.8	.8	.8	.6	1.2	1.2	1.6
4	.7	.5	.5	1.4	2.0	1.8	.8	.6	.6	1.5	1.2	1.5
5	.7	.4	.4	1.6	1.8	1.8	.6	.6	.5	1.5	1.2	1.5
6	1.0	.6	.5	1.8	1.6	1.7	.7	.6	.6	1.8	1.2	1.5
7	1.2	.6	.4	1.8	1.5	1.7	.7	.6	.8	2.2	1.6	1.5
8	.6	.5	.4	1.8	1.4	1.6	.7	.7	.8	2.0	1.6	1.5
9	.4	.4	.4	1.7	1.4	1.5	.7	.6	.7	1.8	1.6	1.7
10	.6	.4	.5	2.0	1.4	1.4	.6	.6	.7	1.7	1.6	2.2
11	.5	.3	.6	2.0	1.4	1.4	.6	.7	.6	1.7	1.6	3.2
12	.5	.4	.6	2.2	1.4	1.4	.6	.6	.6	1.5	2.6	3.2
13	.5	.4	.7	2.8	1.4	1.4	.6	.6	.6	1.4	2.6	3.0
14	.5	.4	.8	3.8	1.2	1.4	.6	.6	.6	1.4	2.5	2.8
15	.5	.4	1.0	3.8	1.3	1.2	.6	.6	.8	1.2	2.3	2.4
16	.4	.5	.8	3.6	1.6	1.2	.6	.8	.8	1.2	2.2	2.2
17	.6	.6	.8	3.3	2.2	1.2	.6	.7	.7	1.6	2.1	2.1
18	.8	.7	.6	2.9	2.4	1.2	.6	.6	.6	1.6	2.2	2.0
19	.6	.6	.8	2.6	2.4	1.0	.6	.7	.6	1.5	2.1	1.9
20	.4	.6	.8	2.4	2.3	1.0	.5	.6	.6	1.4	2.0	1.8
21	.4	.6	1.0	2.4	2.2	1.0	.6	.6	.6	1.4	2.0	1.8
22	.4	.5	1.2	2.2	2.6	1.0	.6	.4	.6	1.6	1.9	1.7
23	.6	.5	1.2	2.0	3.0	.9	.5	.6	.6	1.7	1.9	1.8
24	.3	.6	1.2	2.0	3.0	1.1	.6	.5	.6	1.7	1.8	1.8
25	.4	.5	1.1	1.8	2.9	1.1	.8	.6	.6	1.7	1.7	1.8
26	.4	.6	1.6	1.8	2.6	1.1	.7	.5	.6	1.6	1.7	1.6
27	.5	.6	2.0	1.7	2.2	1.0	.6	.5	.6	1.5	1.7	1.6
28	.5	.6	2.0	1.6	2.0	1.0	.6	.5	.6	1.4	1.8	1.3
29	.5	.....	1.9	1.6	1.8	.9	.5	.6	1.0	1.3	1.6	1.4
30	.4	.....	1.8	1.6	1.6	.9	.6	.6	.8	1.3	1.6	1.5
31	.8	.....	1.6	.....	1.8	.....	.6	.6	.....	1.2	.....	1.5
1912.												
1	1.4	3.2	1.0	1.3	1.8	3.2	1.2	1.2	2.2	.8	.9	1.3
2	1.2	2.9	.9	1.2	1.6	3.0	1.2	1.2	2.4	.8	.9	2.0
3	1.8	2.9	1.0	1.2	1.6	2.8	1.2	1.1	2.6	.8	.9	2.2
4	1.8	3.5	1.1	1.4	1.6	2.6	1.3	1.1	2.4	.8	1.0	2.1
5	1.8	3.4	2.0	2.0	1.6	2.4	1.6	1.1	2.2	.8	1.0	2.1
6	1.9	3.2	3.2	3.0	1.6	2.4	1.6	1.0	2.0	.8	1.2	2.2
7	2.2	3.2	1.1	3.5	1.5	2.3	1.5	1.2	1.8	.8	1.2	2.0
8	3.8	3.3	1.0	3.4	1.5	2.2	1.5	1.3	1.6	.7	1.2	1.9
9	4.4	3.1	.7	3.1	1.6	2.1	1.3	1.2	1.6	.8	1.2	2.0
10	4.4	2.7	.7	2.9	1.4	2.0	1.4	1.5	1.6	.8	1.2	1.7
11	4.5	2.9	.8	2.8	1.5	1.8	1.4	1.4	1.8	.8	1.2	1.5
12	4.5	3.0	.8	2.9	1.8	1.9	1.3	1.4	1.6	1.2	1.0	1.4
13	4.6	3.0	.8	2.8	2.1	1.8	1.4	1.3	1.6	1.2	2.0	1.7
14	4.3	3.0	.8	2.8	1.9	1.8	1.4	1.2	1.5	1.2	2.3	1.4
15	4.2	3.0	.8	2.7	1.8	1.8	1.3	1.2	1.6	1.2	2.0	1.4
16	4.0	3.0	.8	2.6	1.8	1.8	1.2	1.2	1.8	1.0	1.8	1.4
17	3.9	2.8	.8	2.6	2.0	1.8	1.2	1.2	1.8	.9	1.8	1.5
18	4.0	1.2	.8	2.4	2.0	1.6	1.2	1.6	1.8	1.0	1.7	1.3
19	3.8	1.0	1.0	2.2	1.8	1.6	1.2	1.5	1.8	1.0	1.6	1.3
20	3.7	1.0	1.0	2.1	2.6	1.6	1.1	1.5	1.4	.9	1.6	1.3
21	3.6	1.0	1.0	2.0	2.8	1.5	1.2	1.4	1.0	.8	1.6	1.2
22	3.5	2.8	1.0	2.0	3.2	1.5	1.2	1.3	1.1	1.0	1.6	1.2
23	3.6	3.4	.9	2.2	3.6	1.5	1.2	1.3	1.1	1.2	1.5	1.1
24	3.6	3.0	1.0	2.0	3.6	1.4	1.3	1.6	1.0	1.1	1.6	1.2
25	3.5	1.0	1.0	2.0	3.4	1.4	1.3	1.8	1.0	1.0	1.5	1.2
26	3.4	.9	1.0	2.0	3.0	1.4	1.3	1.6	1.0	.9	1.5	1.1
27	3.4	1.0	1.0	1.9	2.8	1.4	1.2	1.6	.9	1.0	1.5	1.1
28	3.3	1.0	1.1	1.8	4.0	1.3	1.2	1.6	.9	.9	1.4	1.2
29	3.3	1.0	1.2	1.8	4.7	1.3	1.2	1.6	.8	.9	1.3	1.1
30	3.4	.....	1.2	1.8	4.2	1.2	1.2	1.6	.8	.8	1.3	1.1
31	3.0	.....	1.4	.....	3.8	.....	1.2	1.6	.....	.8	.....	1.1

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Daily gage height, in feet, of Au Sable River near Lovells, Mich., for 1908–1913—Contd.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1913.												
1	1.0	0.9	0.7	2.8	2.0	1.1	0.8	0.7	0.4	0.4	0.7	1.0
2	1.1	.8	.6	2.6	1.9	1.0	.8	.6	.4	.5	.7	1.2
3	1.0	1.2	.6	3.0	1.6	1.1	.6	.6	.4	.5	.7	1.1
4	1.0	1.0	.7	3.8	1.6	1.1	.6	.6	.5	.5	.7	1.0
5	1.0	1.1	.7	3.8	1.6	1.0	.7	.6	.5	.5	.7	.9
6	1.1	2.8	.5	3.6	1.8	.9	.6	.5	.4	.4	.7	.9
7	.8	3.1	.8	3.4	1.8	1.2	.6	.5	.4	.5	.6	.9
8	1.1	3.0	.9	3.0	1.8	1.1	.5	.4	.4	.6	.7	.8
9	1.3	3.0	.7	2.7	1.6	1.0	.5	.5	.4	.6	.7	.9
10	1.2	3.0	.6	2.8	1.6	.9	.5	.6	.4	.6	.6	.8
11	1.1	2.6	.8	3.2	1.5	.9	.5	.5	.4	1.0	.6	.8
12	1.0	2.8	.8	3.1	1.5	.8	.5	.4	.3	1.0	.7	.8
13	1.2	3.0	.7	3.0	1.4	.8	.6	.4	.4	.9	.7	.8
14	.9	2.5	1.5	2.9	1.4	.8	.6	.4	.4	.7	.7	.8
15	1.0	2.5	2.9	2.6	1.5	.8	.5	.4	.3	.7	.7	.7
16	.9	2.4	2.1	2.4	1.6	.7	.5	.6	.3	.6	.6	.7
17	1.2	2.2	1.9	2.2	1.5	.7	.6	.6	.9	1.1	.7	.7
18	1.3	1.0	1.7	2.2	1.4	.7	.6	.6	.8	1.3	.7	.7
19	1.2	.8	2.0	2.2	1.4	.8	.6	.5	.8	1.2	1.0	.7
20	1.2	.8	3.0	2.1	1.3	.8	.5	.5	.7	1.0	1.6	.7
21	1.1	.8	3.1	2.0	1.4	.9	.5	.4	.8	1.0	1.5	.7
22	1.2	.6	2.8	2.0	1.9	.9	.4	.5	.7	1.0	1.5	.6
23	1.0	.6	2.6	2.1	1.8	.7	.5	.4	.7	1.2	1.5	.6
24	1.0	.7	3.8	1.9	1.7	.7	.5	.4	.6	1.3	1.4	.6
25	1.0	1.0	3.6	2.0	1.6	.6	.5	.4	.6	1.2	1.1	.6
26	1.0	.8	3.2	2.4	1.5	1.0	.4	.4	.5	1.0	1.0	.6
27	1.0	.7	3.0	2.3	1.4	1.4	.5	.4	.5	.8	1.0	.6
28	1.0	.6	2.6	2.2	1.3	1.2	.6	.4	.5	.8	1.0	.6
29	1.2	.....	2.2	2.0	1.3	1.0	.5	.4	.4	.8	1.0	.6
30	1.0	.....	2.3	2.0	1.2	1.0	.6	.4	.3	.8	1.0	.5
31	.9	.....	2.8	.....	1.2	.....	.5	.4	.....	.8	.....	.5

NOTE.—Discharge relation probably affected by ice about Feb. 1–2 and Dec. 29–31, 1909; Jan. 1–12, 1910; Jan. 4–8 and 17–19, 1911; Jan. 3 to Mar. 8, 1912; and Jan. 8–15, Feb. 3–27, and Mar. 7–9, 1913.

Daily discharge, in second-feet, of Au Sable River near Lovelle, Mich., for 1908–1913.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1908.					1908—Con.				
1	.....	727	633	727	16	680	633	633	727
2	.....	633	586	774	17	633	586	633	680
3	.....	633	633	915	18	633	633	633	680
4	.....	633	586	821	19	727	540	633	680
5	.....	633	633	727	20	727	540	633	727
6	.....	633	633	727	21	727	586	633	633
7	.....	633	680	680	22	586	586	633	633
8	.....	633	633	680	23	633	586	633	727
9	.....	633	633	680	24	633	633	727	680
10	.....	633	633	633	25	586	727	821	727
11	680	633	586	680	26	540	680	962	689
12	633	633	633	680	27	540	633	868	633
13	540	633	586	633	28	633	633	821	633
14	540	633	633	680	29	727	633	774	540
15	774	633	633	680	30	633	633	915	633
					31	.....	633	.....	633

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Daily discharge, in second-feet, of Au Sable River near Lovells, Mich., for 1908–1913—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	633	.....	727	821	1,580	1,150	821	915	727	727	727	1,010
2	774	.....	727	962	1,580	1,100	821	821	727	727	774	915
3	633	727	727	1,100	1,580	1,100	821	774	727	727	774	915
4	633	727	727	1,150	1,630	1,100	821	821	727	774	774	868
5	680	727	680	1,480	1,680	1,010	727	821	727	727	727	915
6	633	821	680	1,870	1,680	1,010	727	821	633	727	727	962
7	633	821	680	1,870	1,630	1,100	727	774	633	633	727	915
8	774	774	727	1,870	1,580	1,100	727	774	633	633	727	915
9	1,010	821	727	1,770	1,480	1,010	727	727	633	680	727	915
10	633	821	727	1,580	1,580	1,010	727	727	680	727	727	915
11	633	727	633	1,530	1,480	962	727	727	680	727	727	868
12	727	727	680	1,770	1,440	1,010	727	727	727	633	774	915
13	821	727	727	2,060	1,340	915	774	727	680	727	821	821
14	1,010	680	727	1,960	1,390	1,100	727	727	680	727	868	915
15	633	727	680	1,870	1,480	1,100	727	727	680	727	821	915
16	727	868	727	1,820	1,580	1,010	727	727	680	774	821	915
17	821	821	727	1,720	1,680	1,100	680	727	680	868	868	915
18	633	821	680	1,680	1,680	1,150	680	727	633	821	915	915
19	727	774	680	1,770	1,390	1,060	680	727	633	727	915	821
20	633	727	727	1,720	1,390	1,010	633	680	633	774	915	868
21	586	727	727	1,770	1,290	962	727	680	633	821	915	821
22	633	727	680	1,770	1,240	868	727	680	774	915	962	868
23	821	727	680	1,680	1,200	915	1,580	633	821	962	915	868
24	1,010	821	727	1,530	1,200	915	1,390	633	774	915	868	821
25	1,060	680	774	1,480	1,150	915	1,290	633	774	821	821	821
26	1,010	727	727	1,440	1,100	821	1,150	633	727	727	915	821
27	1,010	727	821	1,480	1,100	868	1,010	633	727	774	915	821
28	868	680	821	1,480	1,240	868	962	680	727	774	1,010	774
29	821	.....	821	1,480	1,240	821	962	727	727	727	1,060	.....
30	727	.....	774	1,480	1,200	821	962	680	727	727	1,060	.....
31	821	.....	727	.....	1,200	.....	915	727	.....	727	.....	.....
1910.												
1	.....	680	680	1,240	962	915	586	586	633	680	821	774
2	.....	680	680	1,200	962	915	586	586	633	680	821	727
3	.....	680	633	1,150	915	915	586	586	633	727	868	774
4	.....	727	680	1,100	915	821	586	633	633	774	821	774
5	.....	633	727	1,100	868	868	586	586	727	821	821	774
6	.....	727	821	1,200	868	868	586	586	821	774	727	727
7	.....	727	915	1,200	821	821	586	633	821	821	727	821
8	.....	727	821	1,150	868	821	540	586	727	774	821	821
9	.....	727	821	1,100	821	821	540	586	774	727	774	821
10	.....	680	774	1,100	821	774	633	633	727	727	821	868
11	.....	727	821	1,100	821	774	633	633	727	727	774	821
12	.....	727	821	1,010	774	727	633	586	915	727	774	727
13	727	680	821	915	774	680	727	586	915	680	821	727
14	727	633	774	915	774	727	680	586	868	680	774	727
15	821	727	774	915	774	727	680	633	821	680	774	727
16	821	727	821	962	774	680	633	633	821	680	727	727
17	821	680	821	1,060	727	727	633	680	727	680	727	727
18	727	727	821	1,010	821	727	633	633	774	680	727	727
19	727	727	727	1,010	821	727	586	586	727	680	727	680
20	727	727	1,390	962	821	774	586	586	727	680	727	633
21	774	680	1,480	962	774	727	633	586	727	727	727	727
22	727	680	1,680	915	821	727	633	586	680	774	727	1,010
23	821	633	1,680	1,010	821	727	633	680	680	821	727	727
24	821	680	1,770	962	962	680	633	633	727	774	774	680
25	727	680	1,770	962	962	633	633	774	727	774	821	727
26	727	727	1,680	1,010	821	633	633	915	727	727	774	774
27	727	774	1,680	1,100	821	633	633	821	727	821	774	727
28	727	727	1,530	1,060	774	633	633	821	727	1,010	821	680
29	727	.....	1,390	1,060	821	633	586	774	680	915	774	680
30	727	.....	1,390	1,010	821	633	633	727	727	915	774	633
31	680	.....	1,290	.....	915	.....	633	680	.....	821	.....	774

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Daily discharge, in second-feet, of Au Sable River near Lovells, Mich., for 1908–1913—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1911.												
1	727	633	633	1,150	1,390	1,340	821	727	727	915	1,100	1,200
2	727	680	680	1,100	1,480	1,340	821	821	727	962	1,010	1,200
3	727	680	680	1,010	1,440	1,290	821	821	727	1,010	1,010	1,200
4	.....	680	680	1,100	1,390	1,290	821	727	727	1,150	1,010	1,150
5	.....	633	633	1,200	1,290	1,290	727	727	680	1,150	1,010	1,150
6	.....	727	680	1,290	1,200	1,240	774	727	727	1,290	1,010	1,150
7	.....	727	633	1,290	1,150	1,240	774	727	821	1,480	1,200	1,150
8	.....	680	633	1,290	1,100	1,200	774	774	821	1,390	1,200	1,150
9	633	633	633	1,240	1,100	1,150	774	727	774	1,290	1,200	1,240
10	727	633	680	1,390	1,100	1,100	727	727	774	1,240	1,200	1,480
11	680	586	727	1,390	1,100	1,100	727	774	727	1,240	1,200	1,960
12	680	633	727	1,480	1,100	1,100	727	727	727	1,150	1,680	1,960
13	680	633	774	1,770	1,100	1,100	727	727	727	1,100	1,680	1,870
14	680	633	821	2,250	1,010	1,100	727	727	727	1,100	1,630	1,770
15	680	633	915	2,250	1,060	1,010	727	727	821	1,010	1,530	1,580
16	633	680	821	2,160	1,200	1,010	727	821	821	1,010	1,480	1,480
17	.....	727	821	2,010	1,480	1,010	727	774	774	1,200	1,440	1,440
18	.....	774	727	1,820	1,580	1,010	727	727	727	1,200	1,480	1,390
19	.....	727	821	1,680	1,580	915	727	774	727	1,150	1,440	1,340
20	633	727	821	1,580	1,530	915	680	727	727	1,100	1,390	1,290
21	633	727	915	1,580	1,480	915	727	727	727	1,100	1,390	1,290
22	633	680	1,010	1,480	1,680	915	727	633	727	1,200	1,340	1,240
23	727	680	1,010	1,390	1,870	868	680	727	727	1,240	1,340	1,290
24	586	727	1,010	1,390	1,870	962	727	680	727	1,240	1,290	1,290
25	633	680	962	1,290	1,820	962	821	727	727	1,240	1,240	1,290
26	633	727	1,200	1,290	1,680	962	774	680	727	1,200	1,240	1,200
27	680	737	1,390	1,240	1,480	915	727	680	727	1,150	1,240	1,200
28	680	727	1,390	1,200	1,390	915	727	680	727	1,200	1,290	1,060
29	680	.....	1,340	1,200	1,290	868	680	727	915	1,060	1,200	1,100
30	633	.....	1,290	1,200	1,200	868	727	727	821	1,060	1,200	1,150
31	821	.....	1,200	.....	1,290	.....	727	727	.....	1,010	.....	1,150
1912.												
1	1,100	.....	.....	1,060	1,290	2,060	1,050	1,050	1,530	863	909	1,100
2	1,010	.....	.....	1,010	1,200	1,950	1,050	1,050	1,640	863	909	1,430
3	.....	.....	.....	1,010	1,200	1,840	1,050	1,000	1,740	863	909	1,530
4	.....	.....	.....	1,100	1,200	1,740	1,100	1,000	1,640	863	955	1,480
5	.....	.....	.....	1,390	1,200	1,640	1,240	1,000	1,530	863	955	1,480
6	.....	.....	.....	1,870	1,200	1,640	1,240	955	1,430	863	1,050	1,530
7	.....	.....	.....	2,110	1,150	1,580	1,190	1,050	1,340	863	1,050	1,430
8	.....	.....	.....	2,060	1,150	1,530	1,190	1,100	1,240	817	1,050	1,380
9	.....	.....	774	1,920	1,200	1,480	1,100	1,050	1,240	863	1,050	1,430
10	.....	.....	774	1,820	1,100	1,430	1,140	1,190	1,240	863	1,050	1,290
11	.....	.....	821	1,770	1,150	1,340	1,140	1,140	1,340	863	1,050	1,190
12	.....	.....	821	1,820	1,290	1,380	1,100	1,140	1,240	1,050	955	1,140
13	.....	.....	821	1,770	1,440	1,340	1,140	1,100	1,240	1,050	1,430	1,290
14	.....	.....	821	1,770	1,340	1,340	1,140	1,050	1,190	1,050	1,580	1,140
15	.....	.....	821	1,720	1,290	1,340	1,100	1,050	1,240	1,050	1,430	1,140
16	.....	.....	821	1,680	1,290	1,340	1,050	1,050	1,340	955	1,340	1,140
17	.....	.....	821	1,680	1,390	1,340	1,050	1,050	1,340	909	1,340	1,190
18	.....	.....	821	1,580	1,390	1,240	1,050	1,240	1,340	955	1,290	1,100
19	.....	.....	915	1,480	1,290	1,240	1,050	1,190	1,340	955	1,240	1,100
20	.....	.....	915	1,440	1,680	1,240	1,000	1,190	1,140	909	1,240	1,100
21	.....	.....	915	1,390	1,770	1,190	1,050	1,140	955	863	1,240	1,050
22	.....	.....	915	1,390	1,960	1,190	1,050	1,100	1,000	955	1,240	1,050
23	.....	.....	868	1,480	2,160	1,190	1,050	1,100	1,000	1,050	1,190	1,000
24	.....	.....	915	1,390	2,160	1,140	1,100	1,240	955	1,000	1,240	1,050
25	.....	.....	915	1,390	2,060	1,140	1,100	1,340	955	955	1,190	1,050
26	.....	.....	915	1,390	1,870	1,140	1,100	1,240	955	909	1,190	1,000
27	.....	.....	915	1,340	1,770	1,140	1,050	1,240	909	955	1,190	1,000
28	.....	.....	962	1,290	2,350	1,100	1,050	1,240	909	909	1,140	1,050
29	.....	.....	1,010	1,290	2,850	1,100	1,050	1,240	863	909	1,100	1,000
30	.....	.....	1,010	1,290	2,580	1,050	1,050	1,240	863	863	1,100	1,000
31	.....	.....	1,100	.....	2,370	.....	1,050	1,240	.....	863	.....	1,000

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Daily discharge, in second-feet, of Au Sable River near Lovells, Mich., for 1908–1913—Con.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1913.												
1	955	909	817	1,840	1,430	1,000	863	817	680	680	817	955
2	1,000	863	771	1,740	1,380	955	863	771	680	725	817	1,060
3	955	.....	771	1,950	1,240	1,000	771	771	680	725	817	1,000
4	955	.....	817	2,370	1,240	1,000	771	771	725	725	817	955
5	955	.....	817	2,370	1,240	1,240	955	817	771	725	817	909
6	1,000	.....	725	2,270	1,340	909	771	725	680	680	817	909
7	863	.....	.....	2,160	1,340	1,050	771	725	680	725	771	909
8	.....	.....	.....	1,950	1,340	1,000	725	680	680	771	817	863
9	.....	.....	.....	1,790	1,240	955	725	725	680	771	817	909
10	.....	.....	771	1,840	1,240	909	725	771	680	771	771	863
11	.....	.....	863	2,060	1,190	909	725	725	680	955	771	863
12	.....	.....	863	2,000	1,190	863	725	680	635	955	817	863
13	.....	.....	817	1,950	1,140	863	771	680	680	909	817	863
14	.....	.....	1,190	1,900	1,140	863	771	680	680	817	817	863
15	.....	.....	1,900	1,740	1,190	863	725	680	635	817	817	817
16	909	.....	1,480	1,640	1,240	817	725	771	635	771	771	817
17	1,050	.....	1,380	1,530	1,190	817	771	771	909	1,000	817	817
18	1,100	.....	1,200	1,530	1,140	817	771	771	863	1,100	817	817
19	1,050	.....	1,430	1,530	1,140	863	771	725	863	1,050	955	817
20	1,050	.....	1,950	1,480	1,100	863	725	725	817	955	1,240	817
21	1,000	.....	2,000	1,430	1,140	909	725	680	863	955	1,190	817
22	1,050	.....	1,840	1,430	1,380	909	680	725	817	955	1,190	771
23	955	.....	1,740	1,480	1,340	817	725	680	817	1,050	1,190	771
24	955	.....	2,370	1,380	1,200	817	725	680	771	1,100	1,140	771
25	955	.....	2,270	1,430	1,240	771	725	680	771	1,050	1,000	711
26	955	.....	2,060	1,640	1,190	955	680	680	725	955	955	771
27	955	.....	1,950	1,580	1,140	1,140	725	680	725	863	955	771
28	955	771	1,740	1,530	1,100	1,050	771	680	725	863	955	771
29	1,050	.....	1,530	1,430	1,100	955	725	680	680	863	955	771
30	955	.....	1,580	1,430	1,050	955	771	680	635	863	955	725
31	909	.....	1,840	.....	1,050	.....	725	680	.....	863	.....	725

NOTE.—Discharge Sept. 11, 1908, to May 28, 1912, computed by engineers of the Geological Survey from a fairly well-defined rating curve based on 10 measurements made during 1908–9 by the Fargo Engineering Co. Discharge May 29, 1912, to Dec. 31, 1913, computed from a well-defined rating curve based on one measurement made by the engineers of the Survey Sept. 20, 1912, and 20 measurements made in 1913 by engineers of the Fargo Engineering Co.

Discharge estimated, because of ice, from gage heights, observer's notes, climatologic records, and discharge of adjacent drainage areas, as follows: Feb. 1–2, 1909, 770 second-feet; Dec. 29–31, 1909, 800 second-feet; Jan. 1–12, 1910, 700 second-feet; Jan. 4–8, 1911, 700 second-feet; Jan. 17–19, 1911, 630 second-feet; Jan. 3–31, 1912, 1,000 second-feet; Feb. 1–29, 1912, 1,000 second-feet; Feb. 1–29, 1912, 900 second-feet; Mar. 1–8, 1912, 800 second-feet; Jan. 8–15, 1913, 850 second-feet; Feb. 3–27, 1913, 800 second-feet; Mar. 7–9, 1913, 750 second-feet.

Monthly discharge of Au Sable River near Lovells, Mich., for 1908–1913.

[Drainage area, 1,000 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Ratio of Lovells to Bamfield.[a]	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.			
1908.							
September 11–30	774	540	640	0.640	0.48	.....	
October	727	540	629	.629	.73	.....	
November	962	586	677	.677	.76	.....	
December	915	540	689	.689	.79	.....	
1909.							
January	1,060	586	767	.767	.88	0.66	
February	868	680	757	.757	.79	.67	
March	821	633	722	.722	.83	.61	
April	2,060	821	1,600	1.60	1.78	.65	
May	1,680	1,100	1,420	1.42	1.64	.68	
June	1,150	821	996	.996	1.11	.68	
July	1,580	633	852	.852	.98	.63	
August	915	633	727	.727	.84	.63	
September	821	633	699	.699	.78	.61	
October	962	633	757	.757	.87	.64	
November	1,060	727	843	.843	.94	.65	
December	1,010	774	875	.875	1.01	.66	
The year	2,060	586	918	.918	12.45	.65	

[a] The ratio of the drainage area of Au Sable River near Lovells to the drainage area at Bamfield is 0.70. See "Accuracy" in station description.

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Monthly discharge of Au Sable River near Lovells, Mich., for 1908–1913—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Ratio of Lovells to Bamfield.	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.			
1910.							
January	.....	.....	732	0.732	0.84	[a]0.64	
February	774	633	702	.702	.73	[a].65	
March	1,770	633	1,080	1.08	1.24	[b].59	
April	1,240	915	1,050	1.05	1.17	.67	
May	962	727	839	.839	.97	.64	
June	915	633	749	.749	.84	.61	
July	727	540	618	.618	.71	.55	
August	915	586	650	.650	.75	.60	
September	915	633	743	.743	.83	.61	
October	1,010	680	757	.757	.87	.63	
November	868	727	776	.776	.87	.63	
December	1,010	633	750	.750	.86	.64	
The year	1,770	540	787	.787	10.68	.63	
1911.							
January	.....	586	675	.675	.78	[a].65	
February	774	586	683	.683	.71	[b].63	
March	1,390	633	879	.879	1.01	.60	
April	2,250	1,010	1,460	1.46	1.63	.68	
May	1,870	1,010	1,370	1.37	1.58	.68	
June	1,340	868	1,060	1.06	1.18	.67	
July	821	680	745	.745	.86	.61	
August	821	633	733	.733	.85	.62	
September	915	680	752	.752	.84	.62	
October	1,480	915	1,160	1.16	1.34	.68	
November	1,680	1,010	1,290	1.29	1.44	.67	
December	1,960	1,060	1,340	1.34	1.54	.66	
The year	2,250	586	1,010	1.01	13.76	.65	
1912.							
January	.....	.....	1,000	1.00	1.15	[a].67	C.
February	.....	.....	900	.900	.97	[a].64	C.
March	.....	.....	864	.864	1.00	[b].65	C.
April	2,110	1,010	1,520	1.52	1.70	.65	B.
May	2,850	1,100	1,590	1.59	1.83	.67	B.
June	2,060	1,050	1,380	1.38	1.54	.69	B.
July	1,240	1,000	1,090	1.09	1.26	.67	A.
August	1,340	955	1,130	1.13	1.30	.69	A.
September	1,740	863	1,220	1.22	1.36	.71	A.
October	1,050	817	921	.921	1.06	.70	A.
November	1,580	909	1,150	1.15	1.28	.68	A.
December	1,530	1,000	1,190	1.19	1.37	.70	A.
The year	2,850	.....	1,160	1.16	15.82	.67	
1913.							
January	1,100	863	946	.946	1.09	[b].71	B.
February	.....	.....	805	.805	.84	[a].67	C.
March	2,370	725	1,350	1.35	1.56	[b].63	B.
April	2,370	1,380	1,750	1.75	1.95	.67	A.
May	1,430	1,050	1,220	1.22	1.41	.69	A.
June	1,140	771	918	.918	1.02	.66	A.
July	863	680	750	.750	.86	.65	A.
August	817	680	718	.718	.83	.65	A.
September	909	635	727	.727	.81	.66	A.
October	1,100	680	871	.871	1.00	.71	A.
November	1,240	771	907	.907	1.01	.64	A.
December	1,050	725	842	.842	.97	.65	B.
The year	2,370	.....	984	.984	13.35	.66	

[a] Discharge at Bamfield obtained by comparison with Lovells.
[b] Part of monthly discharge at Bamfield estimated by comparison with Lovells.

NOTE.—See footnote to table of daily discharge.

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AU SABLE RIVER AT BAMFIELD, MICH.

Location.—At remains of old wooden highway bridge at Bamfield, near Glennie post office, Mich., in the NW. ¼ sec. 14, T. 25 N., R. 5 E., about 600 feet above mouth of Bamfields Creek.

Records available.—August 27, 1902, to December 31, 1913, when station was discontinued.

Drainage area.—1,420 square miles.

Gage.—Staff. Prior to 1913 gage was fastened to wooden crib pier of old bridge, about 600 feet above the steel bridge; read daily, morning and evening, to hundredths. Limits of use: Tenths throughout the range of stage for 1909–1913. On May 13, 1913, new gage was established at steel highway bridge 600 feet below old gage and set to read same as old gage at gage height 2.9 feet. Readings on the two gages probably agree for gage heights within ordinary range of stage. Elevation of zero of gage above sea level, 787.35 feet.

Control.—Shifts during extreme floods.

Discharge measurements.—Made from the steel bridge about 600 feet below wooden bridge at which measurements were formerly made. Bamfields Creek, which enters immediately above steel bridge, carries only a few second-feet of water.

Winter flow.—River frozen over two or three months each year, but open places, probably caused by inflow from springs, may be found throughout the winter.

Accuracy.—Discharge measurements made in 1913 by the Fargo Engineering Co. indicate a decided change in the discharge relation expressed by the rating curve used prior to 1909. Comparison of gage readings at Lovells and Bamfield show no material change in conditions at these stations during 1909–1911, and current-meter measurements at Lovells from 1909–1913 show no large changes in the discharge relation at that station within the period. The comparison further shows that a decided change in discharge relation at Bamfield—the result of scour—occurred during the high water of May, 1912, and another change during September, 1912, when there was a decided fill. Conditions remained practically permanent subsequent to this last change. The ratios of monthly and yearly discharges at Lovells to those at Bamfield, given in the table of monthly discharges, agree closely and indicate that the estimates of discharge published in the following tables are good.

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Discharge measurements of Au Sable River at Bamfield, Mich., in 1909, 1912, and 1913.

Date.	Hydrographer.	Gage height.	Discharge.
1909.		*Feet.*	*Sec.-ft.*
Jan. 12	Wm. M. O'Neill	1.19	[a] 1,050
14	do	1.22	[a] 856
Feb. 16	C. C. Covert	3.73	[a] 1,010
17	do	3.79	[a] 984
Mar. 13	do	1.25	1,180
13	do	1.21	1,140
1912.			
Sept. 18	P. S. Monk	2.30	1,450
1913.			
Apr. 8	Gray and Angell [b]	4.27	2,990
9	do	3.95	2,630
1913.		*Feet.*	*Sec.-ft.*
Apr. 16	Gray and Angell [b]	3.58	2,390
18	do	3.29	2,100
19	do	3.26	2,160
30	do	3.00	1,980
May 3	do	2.80	1,830
14	do	2.41	1,630
22	do	2.75	1,890
June 2	do	2.15	1,490
5	do	2.00	1,380
16	Gray and Banner [b]	1.80	1,270
18	Spring [b]	1.70	1,190
Sept. 4	do	1.55	1,130

[a] Discharge relation affected by backwater from ice.
[b] Engineers of the Fargo Engineering Co., Jackson, Mich.

Daily gage height, in feet, of Au Sable River at Bamfield, Mich., for 1909–1913.

[Mrs. W. H. Bamfield, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1913.												
1	2.0	3.1	.....	4.2	3.0	2.2	2.0	1.6	1.2	1.3	1.7	2.5
2	2.0	3.5	.....	4.0	2.9	2.1	1.9	1.7	1.3	1.4	1.8	2.5
3	1.9	4.1	.....	4.3	2.8	2.1	1.8	1.7	1.4	1.5	1.8	2.3
4	2.0	4.5	3.7	5.5	2.7	2.1	1.7	1.7	1.5	1.4	1.9	2.1
5	2.0	.....	.....	5.4	2.7	2.0	1.8	1.6	1.5	1.3	1.9	2.1
6	2.0	.....	.....	4.9	3.1	2.0	1.6	1.6	1.5	1.4	2.0	2.1
7	2.0	.....	.....	4.6	3.0	2.2	1.5	1.5	1.4	1.3	1.9	2.1
8	1.9	.....	.....	4.4	2.9	2.1	1.3	1.5	1.5	1.4	1.8	2.1
9	1.9	.....	.....	4.0	2.8	2.1	1.4	1.5	1.4	1.6	1.8	1.9
10	2.1	.....	.....	3.8	2.7	2.0	1.4	1.7	1.3	1.8	1.9	1.9
11	2.2	3.8	3.9	4.6	2.6	2.0	1.6	1.6	1.3	1.5	2.0	1.8
12	2.4	.....	.....	4.5	2.5	1.9	1.5	1.5	1.3	2.0	2.1	1.8
13	2.6	.....	.....	4.2	2.5	1.9	1.6	1.4	1.3	2.0	2.0	1.8
14	2.8	.....	3.9	4.0	2.4	1.9	1.6	1.4	1.3	1.9	2.2	1.8
15	2.5	.....	5.6	3.8	2.5	1.8	1.6	1.4	1.3	1.7	2.3	1.8
16	2.3	.....	4.5	3.6	2.7	1.8	1.5	1.4	1.2	1.6	1.7	1.7
17	2.0	.....	4.0	3.4	2.6	1.7	1.6	1.7	1.6	1.8	1.7	1.7
18	2.2	3.9	3.3	3.3	2.5	1.8	1.7	1.6	2.0	1.9	1.7	1.6
19	2.2	.....	3.4	3.2	2.4	1.8	1.6	1.5	2.0	2.3	1.8	1.6
20	2.3	.....	4.3	3.1	2.4	2.0	1.5	1.5	1.7	2.2	1.9	1.6
21	2.3	.....	4.9	3.0	2.4	2.0	1.6	1.5	1.9	2.0	2.0	1.7
22	2.3	.....	4.5	3.1	2.9	2.0	1.5	1.6	1.8	2.0	2.0	1.8
23	2.0	.....	4.1	3.2	2.9	1.9	1.4	1.6	1.8	2.0	2.1	1.8
24	1.9	.....	5.4	3.2	2.8	1.8	1.6	1.5	1.7	1.8	2.2	1.8
25	2.2	3.8	5.7	3.2	2.7	1.8	1.6	1.5	1.6	1.8	2.3	1.8
26	2.0	.....	5.0	3.5	2.6	1.9	1.5	1.4	1.5	1.7	2.5	1.8
27	2.0	.....	4.3	3.5	2.5	2.6	1.5	1.3	1.5	1.8	2.6	1.9
28	2.0	.....	3.8	3.4	2.4	2.6	1.7	1.4	1.4	1.8	2.7	1.8
29	2.2	.....	3.6	3.2	2.3	2.3	1.6	1.4	1.4	1.8	2.6	1.6
30	2.4	.....	3.5	3.0	2.3	2.2	1.5	1.3	1.3	1.7	2.4	1.5
31	2.8	.....	3.8	.....	2.2	.....	1.5	1.3	.....	1.7	.....	1.5

NOTE.—Discharge relation probably affected by ice about Jan. 10–16 and Jan. 29–Mar. 17.

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Daily discharge, in second-feet, of Au Sable River at Bamfield, Mich., for 1909–1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1909.												
1	1,050	1,000	1,140	1,340	2,340	1,700	1,300	1,340	1,140	1,100	1,140	1,570
2	1,050	1,100	1,140	1,570	2,410	1,630	1,300	1,300	1,140	1,140	1,240	1,460
3	1,050	1,200	1,140	1,760	2,340	1,570	1,240	1,240	1,140	1,140	1,200	1,340
4	1,140	1,200	1,140	1,830	2,570	1,570	1,300	1,240	1,240	1,200	1,200	1,340
5	1,050	1,400	1,140	2,040	2,570	1,520	1,240	1,240	1,140	1,200	1,140	1,300
6	1,000	1,500	1,140	2,810	2,570	1,520	1,200	1,240	1,100	1,100	1,140	1,400
7	900	1,200	1,140	3,390	2,490	1,570	1,140	1,240	1,100	1,100	1,140	1,400
8	1,000	1,000	1,140	3,130	2,340	1,520	1,140	1,200	1,050	1,050	1,140	1,400
9	1,100	1,000	1,140	2,890	2,260	1,460	1,140	1,200	1,100	1,050	1,140	1,300
10	1,300	1,200	1,200	2,570	2,190	1,460	1,200	1,140	1,100	1,100	1,240	1,300
11	1,200	1,200	1,240	1,630	2,110	1,460	1,200	1,200	1,300	1,200	1,140	1,340
12	1,050	1,000	1,140	2,410	2,040	1,400	1,200	1,140	1,140	1,140	1,200	1,300
13	850	1,000	1,140	2,810	1,960	1,460	1,200	1,140	1,140	1,050	1,240	1,340
14	856	1,000	1,140	3,390	1,900	1,520	1,200	1,140	1,100	1,140	1,300	1,400
15	900	1,000	1,140	3,050	2,110	1,570	1,200	1,140	1,050	1,140	1,300	1,400
16	1,000	1,010	1,140	2,810	2,490	1,570	1,200	1,140	1,100	1,340	1,300	1,460
17	1,000	984	1,140	2,730	2,410	1,570	1,100	1,100	1,100	1,200	1,300	1,400
18	1,000	950	1,140	2,570	2,490	1,760	1,100	1,100	1,100	1,240	1,340	1,340
19	1,100	1,100	1,200	2,570	2,340	1,630	1,240	1,140	1,050	1,240	1,400	.....
20	1,100	1,200	1,140	2,730	1,960	1,520	1,140	1,100	1,050	1,240	1,300	.....
21	1,140	1,100	1,140	2,650	1,900	1,520	1,300	1,050	1,100	1,240	1,400	.....
22	1,240	1,100	1,140	2,730	1,830	1,400	1,340	1,050	1,140	1,300	1,460	.....
23	1,340	1,140	1,140	2,730	1,830	1,340	1,900	1,100	1,300	1,340	1,400	.....
24	1,630	1,200	1,200	2,650	1,700	1,340	2,190	1,140	1,240	1,340	1,340	.....
25	1,760	1,240	1,240	2,260	1,630	1,300	1,960	1,140	1,300	1,300	1,340	.....
26	1,570	1,200	1,240	2,190	1,630	1,240	1,760	1,140	1,240	1,240	1,300	.....
27	1,520	1,200	1,300	2,110	1,570	1,140	1,520	1,100	1,200	1,140	1,400	.....
28	1,460	1,200	1,300	2,190	1,700	1,100	1,400	1,140	1,200	1,140	1,570	.....
29	1,340	.....	1,300	2,190	1,700	1,140	1,460	1,200	1,140	1,140	1,570	.....
30	1,240	.....	1,300	2,260	1,700	1,300	1,520	1,140	1,140	1,140	1,520	.....
31	1,000	.....	1,300	.....	1,630	.....	1,460	1,100	.....	1,140	.....	.....

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1910.										
1	.....	1,830	1,520	1,400	1,050	1,000	1,240	1,100	1,300	1,200
2	.....	1,830	1,460	1,400	1,000	1,000	1,050	1,100	1,300	1,240
3	.....	1,630	1,460	1,400	1,000	1,000	1,000	1,140	1,300	1,240
4	.....	1,570	1,400	1,340	963	1,050	1,100	1,200	1,240	1,240
5	.....	1,570	1,340	1,300	1,000	1,000	1,140	1,240	1,240	1,240
6	.....	1,570	1,300	1,340	1,050	1,000	1,240	1,300	1,240	1,240
7	1,400	1,570	1,300	1,340	1,050	1,050	1,240	1,300	1,300	1,200
8	1,460	1,630	1,240	1,300	1,300	1,050	1,300	1,240	1,300	1,240
9	1,460	1,630	1,240	1,300	1,240	1,050	1,200	1,200	1,300	1,240
10	1,460	1,570	1,240	1,240	1,240	1,000	1,140	1,140	1,300	1,300
11	1,340	1,570	1,240	1,200	1,460	1,050	1,200	1,140	1,240	1,240
12	1,570	1,520	1,240	1,200	1,200	1,050	1,240	1,140	1,240	1,200
13	1,700	1,460	1,240	1,200	1,100	1,100	1,400	1,100	1,300	1,200
14	1,760	1,460	1,240	1,140	1,100	1,050	1,400	1,100	1,240	1,240
15	1,900	1,400	1,240	1,140	1,140	1,100	1,340	1,100	1,200	1,200
16	2,040	1,400	1,240	1,200	1,200	1,300	1,240	1,050	1,200	1,140
17	2,110	1,460	1,240	1,200	1,140	1,140	1,240	1,050	1,300	1,140
18	2,040	1,520	1,200	1,200	1,050	1,100	1,240	1,050	1,300	1,140
19	2,110	1,520	1,240	1,200	1,050	1,050	1,240	1,050	1,300	1,100
20	2,040	1,520	1,300	1,200	1,050	1,000	1,200	1,100	1,240	1,140
21	2,110	1,570	1,240	1,240	1,050	1,100	1,240	1,200	1,200	1,100
22	2,570	1,570	1,300	1,200	1,050	1,100	1,200	1,300	1,200	1,100
23	2,650	1,520	1,340	1,200	1,050	1,050	1,140	1,240	1,140	.....
24	2,730	1,570	1,460	1,140	1,240	1,050	1,140	1,200	1,140	.....
25	2,650	1,460	1,460	1,100	1,100	1,100	1,200	1,200	1,140	.....
26	2,570	1,570	1,400	1,100	1,340	1,140	1,200	1,300	1,140	.....
27	2,340	1,570	1,340	1,100	1,240	1,140	1,140	1,400	1,140	.....
28	2,190	1,570	1,300	1,100	1,050	1,140	1,200	1,400	1,200	.....
29	2,110	1,460	1,240	1,050	1,240	1,200	1,240	1,460	1,240	.....
30	1,960	1,570	1,240	1,000	1,050	1,140	1,140	1,340	1,200	.....
31	1,960	.....	1,300	.....	1,050	1,100	.....	1,300	.....	.....

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Daily discharge, in second-feet, of Au Sable River at Bamfield, Mich., for 1909–1913—Contd.

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1911.											
1	.....	1,200	1,760	1,960	1,960	1,520	1,140	1,240	1,460	1,570	2,260
2	.....	1,200	1,900	2,260	1,900	1,520	1,200	1,200	1,460	1,570	2,260
3	.....	1,200	1,520	2,110	1,830	1,460	1,200	1,240	1,460	1,570	2,260
4	.....	1,140	1,570	2,110	1,760	1,400	1,200	1,240	1,700	1,520	1,570
5	.....	1,140	1,760	1,900	1,830	1,340	1,200	1,140	1,630	1,520	1,630
6	.....	1,140	2,110	1,830	1,830	1,340	1,200	1,200	1,900	1,460	1,630
7	.....	1,140	2,110	1,700	1,760	1,300	1,200	1,240	2,110	1,520	1,630
8	.....	1,140	1,900	1,630	1,760	1,300	1,140	1,300	2,190	1,700	1,630
9	.....	1,140	1,900	1,630	1,700	1,240	1,140	1,240	1,960	1,760	1,700
10	.....	1,200	2,040	1,570	1,700	1,240	1,200	1,240	1,960	1,700	2,110
11	.....	1,300	2,260	1,570	1,700	1,200	1,200	1,240	1,830	1,700	2,650
12	.....	1,340	2,490	1,570	1,700	1,140	1,140	1,200	1,760	2,340	3,050
13	.....	1,300	2,570	1,520	1,760	1,140	1,140	1,200	1,830	3,130	2,730
14	.....	1,460	3,390	1,520	1,760	1,000	1,140	1,140	1,630	2,890	2,570
15	.....	1,520	3,390	1,520	1,570	1,050	1,140	1,240	1,520	2,810	2,410
16	.....	1,460	2,890	1,700	1,520	1,100	1,240	1,300	1,460	2,650	2,340
17	.....	1,340	2,730	1,900	1,570	1,100	1,300	1,240	1,630	2,570	2,260
18	1,300	1,300	2,650	2,340	1,520	1,140	1,240	1,240	1,760	2,490	2,340
19	1,240	1,300	2,650	2,340	1,400	1,140	1,200	1,200	1,830	2,410	2,260
20	1,240	1,240	2,410	2,260	1,400	1,140	1,200	1,140	1,700	1,570	2,260
21	1,240	1,340	2,260	2,190	1,400	1,200	1,140	1,140	1,570	1,570	1,960
22	1,240	1,520	2,110	2,340	1,400	1,200	1,140	1,200	1,570	1,630	1,900
23	1,200	1,570	1,900	2,570	1,340	1,200	1,140	1,140	1,760	1,700	1,830
24	1,140	1,520	1,900	2,810	1,340	1,200	1,140	1,140	1,830	1,700	1,830
25	1,140	1,520	1,830	2,730	1,300	1,200	1,140	1,200	1,760	1,760	1,760
26	1,200	1,760	1,830	2,570	1,300	1,200	1,100	1,200	1,700	1,830	1,760
27	1,200	2,110	1,760	2,260	1,340	1,200	1,140	1,240	1,630	1,760	1,700
28	1,200	2,260	1,760	2,040	1,340	1,200	1,140	1,200	1,570	1,760	1,700
29	.....	2,570	1,760	1,900	1,340	1,140	1,200	1,300	1,570	1,700	1,630
30	.....	1,960	1,760	1,760	1,340	1,140	1,200	1,340	1,570	1,830	1,630
31	.....	1,830	.....	1,830	.....	1,140	1,240	.....	1,520	.....	1,630

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1912.										
1	.....	1,630	1,760	3,300	1,520	1,460	1,830	1,210	1,320	1,930
2	.....	1,570	1,700	2,890	1,570	1,460	2,190	2,210	1,320	2,340
3	.....	1,570	1,700	2,730	1,570	1,520	2,490	1,210	1,380	2,410
4	.....	1,700	1,700	2,650	1,630	1,520	2,340	1,260	1,320	2,270
5	.....	2,410	1,630	2,490	1,760	1,570	2,260	1,260	1,320	2,130
6	.....	3,210	1,630	2,340	1,700	1,520	2,110	1,210	1,380	2,060
7	.....	3,560	1,630	2,340	1,760	1,520	1,900	1,210	1,500	2,000
8	.....	3,480	1,570	2,190	1,830	1,570	1,830	1,160	1,620	2,000
9	.....	3,050	1,570	2,110	1,760	1,630	1,760	1,160	1,560	2,000
10	.....	2,810	1,570	2,040	1,700	1,630	1,830	1,210	1,500	2,060
11	.....	2,650	1,520	2,040	1,700	1,760	1,830	1,260	1,440	1,930
12	.....	2,650	1,830	2,040	1,630	1,760	1,760	1,440	1,380	1,740
13	.....	2,570	1,960	2,040	1,570	1,700	1,760	1,620	1,740	1,930
14	.....	2,650	2,110	1,960	1,700	1,570	1,700	1,560	2,410	1,740
15	.....	2,730	1,830	1,900	1,900	1,520	1,830	1,440	2,200	1,560
16	.....	2,650	1,760	1,900	2,040	1,460	1,900	1,380	2,270	1,500
17	.....	2,650	1,960	1,760	1,760	1,460	2,040	1,320	2,270	1,560
18	.....	2,490	1,900	1,760	1,700	1,630	1,620	1,320	1,500	1,560
19	.....	2,340	1,830	1,760	1,630	1,760	1,560	1,320	1,860	1,440
20	.....	2,190	2,190	1,760	1,570	1,760	1,560	1,260	1,680	1,440
21	.....	2,190	2,890	1,700	1,520	1,700	1,500	1,260	1,620	1,440
22	.....	2,040	2,970	1,700	1,460	1,760	1,440	1,260	1,680	1,440
23	.....	2,110	3,300	1,630	1,460	1,760	1,440	1,380	1,740	1,440
24	.....	2,040	3,840	1,630	1,520	1,760	1,380	1,380	1,800	1,440
25	.....	2,110	3,300	1,630	1,630	1,700	1,380	1,380	1,800	1,440
26	1,400	1,360	3,130	1,570	1,570	1,700	1,380	1,320	1,740	1,440
27	1,400	1,900	3,050	1,570	1,570	1,630	1,320	1,260	1,740	1,380
28	1,460	1,830	3,210	1,570	1,460	1,630	1,260	1,260	1,680	1,380
29	1,520	1,830	4,020	1,520	1,460	1,760	1,260	1,320	1,740	1,380
30	1,630	1,760	4,420	1,520	1,460	1,760	1,210	1,320	1,740	1,380
31	1,760	.....	3,740	.....	1,460	1,760	.....	1,320	.....	1,380

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Daily discharge, in second-feet, of Au Sable River at Bamfield, Mich., for 1909–1913—Contd.

Day.	Jan.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1913.											
1	1,380	.....	2,880	2,000	1,500	1,380	1,160	950	1,000	1,210	1,680
2	1,380	.....	2,720	1,930	1,440	1,320	1,210	1,000	1,050	1,260	1,680
3	1,320	.....	2,960	1,860	1,440	1,260	1,210	1,050	1,100	1,260	1,560
4	1,380	.....	3,960	1,800	1,440	1,210	1,210	1,100	1,050	1,320	1,440
5	1,380	.....	3,880	1,800	1,380	1,260	1,160	1,100	1,000	1,320	1,440
6	1,380	.....	3,450	2,060	1,380	1,160	1,160	1,100	1,050	1,380	1,440
7	1,380	.....	3,200	2,000	1,500	1,100	1,100	1,050	1,000	1,320	1,440
8	1,320	.....	3,040	1,930	1,440	1,000	1,100	1,100	1,050	1,260	1,440
9	1,320	.....	2,720	1,860	1,440	1,050	1,100	1,050	1,160	1,260	1,320
10	.....	.....	2,560	1,800	1,380	1,050	1,210	1,000	1,260	1,320	1,320
11	.....	.....	3,200	1,740	1,380	1,160	1,160	1,000	1,100	1,380	1,260
12	.....	.....	3,120	1,680	1,320	1,100	1,100	1,000	1,380	1,440	1,260
13	.....	.....	2,880	1,680	1,320	1,160	1,050	1,000	1,380	1,380	1,260
14	.....	.....	2,720	1,620	1,320	1,160	1,050	1,000	1,320	1,500	1,260
15	.....	.....	2,560	1,680	1,260	1,160	1,050	1,000	1,210	1,560	1,260
16	.....	.....	2,410	1,800	1,260	1,100	1,050	950	1,160	1,210	1,210
17	1,380	.....	2,270	1,740	1,210	1,160	1,210	1,160	1,260	1,210	1,210
18	1,500	2,200	2,200	1,680	1,260	1,210	1,160	1,380	1,320	1,210	1,160
19	1,500	2,270	2,130	1,620	1,260	1,160	1,100	1,380	1,560	1,260	1,160
20	1,560	2,960	2,060	1,620	1,380	1,100	1,100	1,210	1,500	1,320	1,160
21	1,560	3,450	2,000	1,620	1,380	1,160	1,100	1,320	1,380	1,380	1,210
22	1,560	3,120	2,060	1,930	1,380	1,100	1,160	1,260	1,380	1,380	1,260
23	1,380	2,800	2,130	1,930	1,320	1,050	1,160	1,260	1,380	1,440	1,260
24	1,320	3,880	2,130	1,860	1,260	1,160	1,100	1,210	1,260	1,500	1,260
25	1,500	4,140	2,130	1,800	1,260	1,160	1,100	1,160	1,260	1,560	1,260
26	1,380	3,540	2,340	1,740	1,320	1,100	1,050	1,100	1,210	1,680	1,260
27	1,380	2,960	2,340	1,680	1,740	1,100	1,000	1,100	1,260	1,740	1,320
28	1,380	2,560	2,270	1,620	1,740	1,210	1,050	1,050	1,260	1,800	1,260
29	.....	2,410	2,130	1,560	1,560	1,160	1,050	1,050	1,260	1,740	1,160
30	.....	2,340	2,000	1,560	1,500	1,100	1,000	1,000	1,210	1,620	1,100
31	.....	2,560	.....	1,500	.....	1,100	1,000	.....	1,210	.....	1,100

NOTE.—Discharge Jan. 1, 1909, to May 11, 1912, computed from rating curve based on discharge measurements made during March, 1909, and the form of the previous rating curve; discharge from May 12 to Sept. 17, 1912, also computed from the above rating curve by making proper allowance for scour which occurred during May, 1912 (see "Accuracy" in station desrription); discharge Sept. 18, 1912, to Dec. 31, 1913, computed from a rating curve based on numerous measurements made by the Fargo Engineering Co. during 1913, well defined between 1,100 and 3,540 second-feet (gage heights 1.5 and 5.0 feet), and fairly well defined beyond those points.

Discharge Jan. 6–20 and Jan. 31 to Feb. 22, 1909, estimated, because of ice, from gage heights, four discharge measurements, observer's notes, and climatologic records.

Discharge estimated, because of ice, from gage heights, observer's notes, climatologic records and discharge of Au Sable River at Lovells, as follows: Dec. 19–31, 1909, 1,230 second-feet; Jan. 1–31, 1910, 1,140 second-feet; Feb. 1–28, 1910, 1,080 second-feet; Mar. 1–6, 1910, 1,080 second-feet; Dec. 23–31, 1910, 1,100 second-feet; Jan. 1–31, 1911, 1,040 second-feet; Feb. 1–17, 1911, 1,000 second-feet; Jan. 1–31, 1912, 1,500 second-feet; Feb. 1–29, 1912, 1,400 second-feet; Mar. 1–25, 1912, 1,280 second-feet; Jan. 10–16, 1913, 1,350 second-feet; Jan. 29–31, 1913, 1,380 second feet; Feb. 1–28, 1913, 1,200 second-feet; Mar. 1–17, 1913, 1,470 second-feet.

Monthly discharge of Au Sable River at Bamfield, Mich., for 1909–1913.

[Drainage area, 1,420 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	[a] Ratio of Lovells to Bamfield.	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.			
1909.							
January	1,760	850	1,160	0.817	0.94	0.66	
February	1,500	950	1,130	.796	.83	.67	
March	1,300	1,140	1,180	.831	.96	.61	
April	3,390	1,340	2,470	1.74	1.94	.65	
May	2,570	1,570	2,090	1.47	1.70	.68	
June	1,760	1,100	1,460	1.03	1.15	.68	
July	2,190	1,100	1,350	.951	1.10	.63	
August	1,340	1,050	1,160	.817	.94	.63	
September	1,300	1,050	1,150	.810	.90	.61	
October	1,340	1,050	1,180	.831	.96	.64	
November	1,570	1,140	1,290	.908	1.01	.65	
December	1,570	.....	1,320	.930	1.07	.66	
The year	3,390	850	1,410	.993	13.50	.65	

[a] The ratio of the drainage area of Au Sable River near Lovells to the drainage area at Bamfield is 0.70. See "Accuracy" in station description.

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Monthly discharge of Au Sable River at Bamfield, Mich., for 1909–1913—Continued.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Ratio of Lovells to Bamfield.	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.			
1910.							
January	.....	.....	1,140	0.803	0.93	a 0.64	
February	.....	.....	1,080	.761	.79	a. 65	
March	2,730	.....	1,830	1.29	1.49	b. 59	
April	1,830	1,400	1,560	1.10	1.23	.67	
May	1,520	1,200	1,310	.923	1.06	.64	
June	1,400	1,000	1,220	.859	.96	.61	
July	1,460	963	1,120	.789	.91	.55	
August	1,300	1,000	1,080	.761	.88	.60	
September	1,400	1,000	1,210	.852	.95	.61	
October	1,460	1,060	1,200	.845	.97	.63	
November	1,300	1,140	1,240	.873	.97	.63	
December	1,300	.....	1,170	.824	.95	.64	
The year	2,730	.....	1,260	.887	12.09	.63	
1911.							
January	.....	.....	1,040	.732	.84	a. 65	
February	.....	.....	1,080	.761	.79	b. 63	
March	2,570	1,140	1,460	1.03	1.19	.60	
April	3,390	1,520	2,160	1.52	1.70	.68	
May	2,810	1,520	2,000	1.41	1.63	.68	
June	1,960	1,300	1,580	1.11	1.24	.67	
July	1,520	1,000	1,220	.859	.99	.61	
August	1,300	1,100	1,180	.831	.96	.62	
September	1,340	1,140	1,220	.859	.96	.62	
October	2,190	1,460	1,700	1.20	1.38	.68	
November	3,130	1,460	1,920	1.35	1.51	.67	
December	3,050	1,570	2,030	1.43	1.65	.66	
The year	3,390	.....	1,550	1.09	14.84	.65	
1912.							
January	.....	.....	1,500	1.06	1.22	a. 67	
February	.....	.....	1,400	.986	1.06	a. 64	
March	1,760	.....	1,330	.937	1.08	b. 65	
April	3,560	1,570	2,340	1.65	1.84	.65	
May	4,420	1,520	2,360	1.66	1.91	.67	
June	3,300	1,520	2,000	1.41	1.57	.69	
July	2,040	1,460	1,630	1.15	1.33	.67	
August	1,760	1,460	1,640	1.15	1.33	.69	
September	2,490	1,210	1,720	1.21	1.35	.71	
October	1,620	1,160	1,310	.923	1.06	.70	
November	2,410	1,320	1,680	1.18	1.32	.68	
December	2,410	1,380	1,710	1.20	1.38	.70	
The year	4,420	1,160	1,720	1.21	16.45	.67	
1913.							
January	.....	1,320	1,390	.979	1.13	b. 71	C.
February	.....	.....	1,200	.845	.88	a. 67	C.
March	4,140	.....	2,130	1.50	1.73	b. 63	C.
April	3,960	2,000	2,620	1.85	2.06	.67	A.
May	2,060	1,500	1,760	1.24	1.43	.69	A.
June	1,740	1,210	1,390	.979	1.09	.66	A.
July	1,380	1,000	1,150	.810	.93	.65	A.
August	1,210	1,000	1,110	.782	.90	.65	A.
September	1,380	950	1,100	.775	.86	.66	A.
October	1,560	1,000	1,230	.866	1.00	.71	A.
November	1,800	1,210	1,410	.993	1.11	.64	A.
December	1,680	1,100	1,300	.915	1.05	.65	B.
The year	4,140	950	1,480	1.04	14.17	.66	

a Discharge at Bamfield obtained by comparison with Lovells.
b Part of discharge at Bamfield obtained by comparison with Lovells.

NOTE.—See footnote to table of daily discharge.

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TITTABAWASSEE RIVER AT FREELAND, MICH.

Location.—At highway bridge at Freeland, Mich.

Records available.—August 22, 1903, to August 3, 1906; October 28, 1906, to December 31, 1909; January 1, 1912, to December 31, 1913.

Drainage area.—2,530 square miles.[1]

Cooperation.—Estimates of daily discharge were made and furnished by G. S. Williams, consulting engineer, Ann Arbor, Mich.

Daily discharge, in second-feet, of Tittabawassee River at Freeland, Mich., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,710	1,620	1,805	3,575	2,510	1,080	908	746	790	685	1,110	1,300
2	1,625	1,585	1,815	3,700	2,190	1,050	872	770	812	675	1,140	1,600
3	1,570	1,480	1,815	3,400	1,920	1,050	930	758	813	645	1,170	1,920
4	1,525	1,490	1,760	4,850	1,600	1,025	900	758	730	663	1,190	2,070
5	1,485	1,435	1,720	5,910	1,530	1,000	872	746	702	685	1,170	2,065
6	1,400	1,395	1,725	5,400	1,490	965	803	730	712	702	1,170	2,030
7	1,390	1,360	1,905	4,650	1,460	953	758	740	690	718	1,200	2,000
8	1,395	1,300	2,180	4,425	1,380	930	722	930	675	758	1,220	2,060
9	1,415	1,355	2,430	4,275	1,350	900	712	1,825	698	832	1,240	1,990
10	1,430	1,395	2,730	4,050	1,320	884	690	2,930	712	900	1,270	1,750
11	1,430	1,500	2,950	3,325	1,300	872	675	3,860	702	930	1,300	1,600
12	1,420	1,620	3,870	3,575	1,300	832	645	3,280	685	1,005	1,310	1,390
13	1,405	1,625	4,910	3,350	1,470	815	645	2,320	680	1,030	1,360	1,300
14	1,395	1,600	5,400	3,075	1,680	795	625	2,150	675	1,058	1,350	1,390
15	1,390	1,520	6,950	2,950	1,850	785	567	2,000	675	1,070	1,300	1,300
16	1,830	1,530	8,280	2,850	2,000	765	567	1,900	608	1,100	1,270	1,240
17	2,405	1,560	7,000	2,740	2,230	718	570	1,825	625	1,065	1,230	1,200
18	3,400	1,760	5,275	2,600	2,240	702	592	1,750	620	1,035	1,200	1,170
19	4,025	1,950	4,225	2,510	2,200	690	620	1,510	653	990	1,215	1,140
20	3,775	2,150	4,350	2,420	1,920	680	658	1,600	667	960	1,230	1,100
21	3,400	2,300	4,650	2,320	1,760	675	685	1,390	690	990	1,285	1,080
22	3,080	2,210	4,925	2,160	1,600	675	712	1,238	712	990	1,350	1,040
23	2,630	2,050	5,400	2,150	1,490	827	787	1,058	735	1,080	1,535	1,000
24	2,220	2,005	5,910	2,570	1,450	930	758	1,025	712	1,110	1,825	930
25	2,020	1,870	6,850	3,125	1,400	832	746	990	702	1,085	1,600	870
26	1,950	1,860	6,350	3,300	1,380	712	758	965	675	1,050	1,480	800
27	1,860	1,830	5,780	3,490	1,330	930	770	930	690	1,035	1,390	755
28	1,760	1,820	5,350	3,425	1,300	930	774	930	702	1,020	1,350	700
29	1,760	.....	4,575	3,300	1,180	930	746	882	712	1,035	1,300	680
30	1,710	.....	4,275	2,940	1,150	908	730	850	702	1,070	1,300	685
31	1,655	.....	3,900	.....	1,080	.....	722	813	.....	1,100	.....	690

Monthly discharge of Tittabawassee River at Freeland, Mich., for 1913.

[Drainage area, 2,530 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	4,025	1,390	1,980	0.783	0.90
February	2,300	1,300	1,680	.664	.69
March	8,280	1,720	4,230	1.67	1.92
April	5,910	2,150	3,410	1.35	1.51
May	2,510	1,060	1,610	.636	.73
June	1,080	675	861	.340	.38
July	930	567	726	.287	.33
August	3,860	730	1,430	.565	.65
September	813	608	699	.276	.31
October	1,110	645	938	.371	.43
November	1,825	1,110	1,300	.514	.57
December	2,070	680	1,320	.522	.60
The year	8,280	567	1,680	.664	9.02

[1] Revised since last report.

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HURON RIVER AT DEXTER, MICH.

Location.—At the highway bridge at Dexter, Mich., one-fourth mile below mouth of Mill Creek.

Records available.—September 1, 1904, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Standard chain, attached to bridge; read daily, morning and evening, to half-tenths. Limits of use: Hundredths below 0.5, half-tenths from 0.5 to 1.5, and tenths above 1.5 feet.

Control.—The high water that carried out the gage on March 12, 1908, produced permanent change in the bed of the river; a small headrace runs to an abandoned mill on the left bank, but at ordinary stages little or no water flows into this canal; at high stages a small amount of water may pass around the gage through this race.

Discharge measurements.—Made from a boat several hundred feet below gage or from bridge to which gage is attached.

Winter flow.—Little ice forms at this section; current is swift.

Accuracy.—Discharge relation that existed prior to March 12, 1908, was altered as the result of the change in the river bed produced at that time; gage heights only slightly affected by ice. The station was inspected September 23, 1912, when the chain was found to be 0.13 too long. It was correct on October 17, 1908. Gage readings published for 1909, 1910, and 1911 should be corrected on account of this elongation of the chain.

Cooperation.—Station maintained in cooperation with Eastern Michigan Edison Co., Washtenaw division, Ann Arbor, Mich.

No discharge measurements were made at this station during the year 1913.

Daily gage height, in feet, of Huron River at Dexter, Mich., for 1913.

[D. M. Litchfield, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nv.	Dec.
1	0.00	1.7	0.18	2.9	0.9	0.7	−0.20	−0.35	−0.20	−0.25	0.15	0.52
2	.00	1.4	.15	2.8	.8	.6	− .28	− .38	− .20	− .20	.15	.55
3	− .02	1.0	.25	3.4	.65	.5	− .30	− .35	− .25	− .20	.10	.52
4	− .05	1.0	.10	3.8	.6	.5	− .30	− .35	− .25	− .22	.10	.48
5	.25	.8	.10	3.5	.5	.42	− .22	− .38	− .30	− .25	.05	.45
6	.42	.7	− .02	3.2	.48	.32	− .28	− .40	− .25	− .20	.02	.48
7	.5	.7	.20	3.0	.38	.28	− .30	− .40	− .25	− .18	.02	.5
8	.5	.6	.20	2.8	.30	.22	− .32	− .38	− .28	− .22	.00	.42
9	.6	.48	.40	2.6	.28	.18	− .35	− .28	− .28	− .22	.02	.38
10	.6	.40	.8	2.6	.20	.18	− .35	− .28	− .25	− .22	.02	.35
11	.32	.30	1.05	2.8	.22	.12	− .35	− .25	− .30	− .18	.02	.32
12	.40	.38	1.2	2.7	.20	.10	− .40	− .25	− .30	− .20	.08	.30
13	.38	.48	1.3	2.5	.22	.12	− .40	− .28	− .30	− .20	.18	.30
14	.28	.48	1.8	2.2	.28	.02	− .48	− .30	− .30	− .18	.25	.30
15	.20	.18	1.9	2.1	.48	.00	− .48	− .30	− .32	− .20	.28	.28
16	1.0	.20	1.6	2.0	1.25	− .08	− .42	− .30	− .35	− .20	.25	.25
17	2.5	.15	1.5	1.8	1.4	− .08	− .38	− .30	− .30	− .20	.20	.22
18	2.4	− .02	1.6	1.6	1.3	− .10	− .40	− .28	− .38	− .15	.22	.20
19	2.2	− .05	1.5	1.5	1.15	− .12	− .48	− .25	− .30	− .12	.32	.20
20	2.8	.25	1.4	1.4	1.0	− .20	− .40	− .25	− .30	− .12	.45	.20
21	3.0	.30	1.5	1.2	1.0	− .20	− .35	− .22	− .30	− .12	.42	.18
22	3.0	.30	1.6	1.05	1.0	− .15	− .35	− .20	− .30	− .08	.35	.12
23	2.8	.30	1.5	1.0	1.0	− .15	− .35	− .22	− .30	− .02	.30	.10
24	2.8	.30	2.8	.9	.9	− .12	− .40	− .22	− .30	.05	.30	.10
25	2.7	.30	3.2	.8	.7	− .15	− .40	− .18	− .30	.00	.28	.10
26	2.6	.20	3.4	.9	.6	− .15	− .40	− .20	− .30	.00	.22	.10
27	2.5	.25	2.8	1.0	1.0	− .20	− .38	− .22	− .28	.05	.22	.05
28	2.3	.20	2.7	1.1	1.1	− .20	− .30	− .22	− .28	.20	.28	.00
29	2.2	.....	2.9	1.0	1.0	− .20	− .30	− .22	− .28	.22	.32	.00
30	1.7	.....	3.0	.9	1.0	− .20	− .30	− .25	− .28	.20	.38	.05
31	1.6	.....	3.0	.....	.8	.....	− .30	− .20	.....	.12	.....	.05

NOTE.—Observer made complete notes concerning ice. Discharge relation probably affected by ice about Jan. 5–13, and Jan. 28 to Feb. 17.

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HURON RIVER AT GEDDES, MICH.

Location.—At dam and power plant of the Eastern Michigan Edison Co., at Geddes, Mich., half a mile above mouth of Fleming Creek.

Records available.—February 1, 1904, to December 31, 1913.

Drainage area.—757 square miles.

Determination of discharge.—The flow of the river at this point is computed from records of the operation of the power plant and records of depth of flow over dam.

Cooperation.—Estimates of daily discharge were made and furnished by G. S. Williams, consulting engineer, Ann Arbor, Mich.

Daily discharge, in second-feet, of Huron River at Geddes, Mich., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	270	1,825	535	2,368	1,133	1,142	382	124	302	172	380	591
2	286	1,410	378	2,370	1,064	997	297	135	182	198	301	601
3	326	1,222	476	2,605	1,030	848	288	122	201	203	360	623
4	312	1,019	418	3,352	903	664	313	57	182	197	419	572
5	229	905	284	2,886	875	862	321	61	167	183	360	540
6	498	872	448	2,708	815	764	334	133	162	174	319	542
7	744	622	336	2,348	804	830	311	127	236	207	308	509
8	727	946	432	2,234	664	790	311	124	422	203	292	655
9	645	1,184	846	2,124	638	850	328	111	155	193	274	586
10	427	873	1,306	2,164	650	492	243	195	167	199	313	422
11	720	777	1,163	2,465	645	520	144	107	250	215	304	510
12	776	534	1,261	2,328	608	478	179	156	188	200	330	473
13	631	395	1,415	2,014	566	487	179	294	202	173	308	480
14	603	448	1,912	1,925	630	538	233	140	179	183	414	480
15	518	580	1,825	1,921	887	454	290	65	103	210	406	496
16	799	664	1,685	1,673	2,027	472	319	112	163	215	420	473
17	2,110	349	1,420	1,424	1,465	448	332	203	148	223	404	285
18	2,120	352	1,495	1,516	1,540	428	353	104	145	231	415	476
19	1,875	395	1,519	1,421	1,232	389	333	194	153	236	396	459
20	2,175	476	1,493	1,196	1,221	431	205	190	148	236	435	439
21	2,155	560	1,478	1,125	1,200	391	95	219	167	257	451	430
22	2,181	565	1,428	1,147	1,255	369	180	229	343	252	439	590
23	2,140	527	1,398	1,073	1,208	316	84	177	164	294	440	460
24	2,255	548	2,497	1,299	1,129	376	131	242	319	307	437	404
25	2,045	567	2,790	1,053	1,058	355	112	125	163	288	436	500
26	2,065	538	2,763	1,076	1,095	334	110	230	165	303	456	321
27	1,900	533	2,289	1,226	1,232	365	154	154	141	305	399	335
28	1,913	541	2,014	1,404	1,364	327	153	193	152	340	453	358
29	1,745	.....	2,300	1,198	1,211	324	213	193	149	369	408	289
30	1,655	.....	2,330	1,231	1,227	350	93	217	156	406	449	339
31	1,652	.....	2,407	.....	1,142	.....	157	211	.....	387	.....	342

Monthly discharge of Huron River at Geddes, Mich., for 1913.

[Drainage area, 757 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	2,255	229	1,240	1.64	1.89
February	1,825	349	722	.954	.99
March	2,790	284	1,430	1.89	2.18
April	3,352	1,053	1,830	2.42	2.70
May	2,027	566	1,050	1.39	1.60
June	1,142	316	546	.721	.80
July	382	84	231	.305	.35
August	294	57	159	.210	.24
September	422	103	192	.254	.28
October	406	172	244	.322	.37
November	456	274	384	.507	.57
December	655	269	470	.621	.72
The year	3,352	57	708	.935	12.69

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HURON RIVER AT FLAT ROCK, MICH.

Location.—At the highway bridge at Flat Rock, Mich., 2,000 feet below the crossing of the Detroit, Toledo & Ironton Railway.

Records available.—August 6, 1904, to December 31, 1913.

Drainage area.—1,000 square miles.

Gage.—Staff; gage read daily, morning and evening, to tenths. Limits of use: Half-tenths below 1.5 and tenths above 1.5 feet.

Control.—Probably permanent.

Discharge measurements.—Made from downstream side of bridge.

Regulation.—At ordinary stages flow of the river is controlled by a dam and power plant immediately above station, but operation of this plant is assumed to have little effect on diurnal fluctuations of stage.

Winter flow.—Ice jams form below the station and cause backwater at the gage; in general the section above the station is kept open by the power plant.

Accuracy.—Station last inspected September 25, 1912; a measurement on this date indicates marked change in discharge relation since October 16, 1908.

Cooperation.—Station maintained in cooperation with Eastern Michigan Edison Co., Washtenaw division, Ann Arbor, Mich.

Daily gage height, in feet, of Huron River at Flat Rock, Mich., for 1913.

[C. L. Metler, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.1	4.8	3.2	7.7	4.0	3.8	0.85	0.6	1.05	1.1	2.1	2.7
2	1.8	7.1	3.2	7.6	3.8	3.4	1.05	.6	.95	1.2	2.1	3.1
3	1.8	7.4	2.6	7.5	3.6	3.4	1.2	.6	.9	1.1	.85	3.0
4	1.7	7.6	2.9	7.8	3.6	3.3	1.0	.6	.95	1.35	1.9	3.0
5	1.8	6.8	3.0	8.2	2.8	2.6	.8	.30	1.0	1.0	2.2	3.0
6	1.8	6.0	3.0	8.0	3.2	3.0	.8	.6	.95	1.1	2.1	2.9
7	2.2	6.0	2.4	7.7	3.0	2.9	.8	.7	.....	1.0	2.0	2.7
8	3.0	5.4	2.6	7.4	2.9	2.6	.8	.9	1.1	1.1	2.0	2.8
9	3.1	5.2	2.8	7.0	2.8	2.7	1.1	.9	.9	1.1	1.9	2.8
10	2.8	5.7	4.6	7.0	2.4	3.0	1.05	.6	.9	1.1	1.4	2.8
11	2.8	5.8	7.2	7.4	2.4	2.0	.7	.8	.9	1.05	1.9	2.6
12	2.9	5.2	6.6	7.6	2.3	1.8	.8	.7	.95	1.0	1.8	2.6
13	3.0	4.6	6.6	7.3	2.4	1.8	.6	.9	.95	1.1	2.0	2.6
14	3.3	3.8	6.4	7.0	2.2	1.8	.35	1.25	.....	1.05	2.0	2.6
15	3.0	3.8	6.2	6.6	2.2	1.8	.40	1.15	.9	1.45	2.2	2.4
16	2.9	4.4	6.0	6.2	3.6	1.6	.5	.9	.8	1.8	2.2	2.5
17	4.4	3.8	5.2	6.0	5.2	1.8	.5	.5	.85	1.25	2.2	2.2
18	6.8	3.4	4.8	5.4	5.0	1.8	.6	.5	1.0	1.1	2.1	2.2
19	8.2	3.4	4.7	5.2	4.8	1.8	.6	.75	.8	1.6	2.4	2.1
20	7.7	3.4	4.8	5.0	4.4	1.4	.5	.95	1.05	1.15	2.2	2.0
21	7.3	3.2	5.1	4.8	4.0	1.2	.55	.95	.9	1.3	2.2	2.0
22	8.2	3.9	5.6	4.6	4.4	1.1	.30	1.0	.85	1.3	2.2	1.8
23	7.8	3.7	5.6	4.3	4.2	1.05	.5	.8	1.05	1.15	2.3	2.2
24	7.8	3.9	6.6	4.1	4.1	1.0	.40	1.0	1.05	1.9	2.3	2.2
25	7.9	3.4	8.2	4.0	3.8	1.1	.55	.95	1.0	1.9	2.5	2.0
26	7.2	3.4	8.5	3.6	3.8	1.2	.40	1.05	1.0	1.9	2.4	1.8
27	6.9	3.4	8.4	3.9	4.6	1.2	.40	1.1	1.0	1.4	2.2	2.0
28	6.7	3.2	7.8	4.2	4.9	1.2	.7	.85	.9	2.1	2.4	2.2
29	6.7	.....	7.3	4.5	5.0	1.0	.8	.95	.7	2.0	2.2	2.0
30	6.0	.....	7.4	4.4	4.4	1.1	.8	.95	.7	2.2	2.4	2.2
31	5.0	.....	7.7	.....	4.0	.....	1.0	.....	.....	2.2	.....	2.0

NOTE.—Observer made no notes concerning ice. Discharge relation probably not materially affected by ice during 1913.

CATTARAUGUS CREEK AT VERSAILLES, N. Y.

Location.—On a three-span highway bridge in the village of Versailles, about 6 miles below Gowanda, 2¼ miles above mouth of Clear Creek (coming in from the right), and about 8 miles above mouth of stream.

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Records available.—September 23, 1910, to December 31, 1913. Data published also in annual reports of the State of New York Conservation Commission and the New York State engineer and surveyor.

Drainage area.—467 square miles.

Gage.—Chain, fastened to the upstream side of the first span from the right-hand end of the bridge; read daily, morning and evening, to half-tenths. Limits of use: Hundredths below 6.0, half-tenths from 6.0 to 7.5, and tenths above 7.5 feet.

Control.—Rock and gravel. Shifted by flood in March, 1913.

Discharge measurements.—Made from downstream side of bridge.

Winter flow.—Discharge relation affected by ice.

Floods.—The flood of March, 1913, reached gage height 11.6 feet at 5.40 p. m. March 25, as recorded by the gage observer. Later determinations, made by engineers of the Geological Survey and based upon high-water marks, indicate that flood crest may have exceeded height noted by observer. The corresponding discharge was approximately 30,000 second-feet, or 64 second-feet per square mile of drainage area.

Accuracy.—Discharge curve fairly well defined. Estimates as published fairly good.

Discharge measurements of Cattaraugus Creek at Versailles, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Mar. 30	C. S. DeGolyer	6.35	1,870	Apr. 30	C. S. De Golyer	6.37	1,850
31	do	6.22	1,510	Aug. 14	G. H. Canfield	4.87	122
Apr. 29	do	7.06	3,580	Oct. 31	R. S. Barnes	5.19	287

Daily gage height, in feet, of Cattaraugus Creek at Versailles, N. Y., for 1913.

[James Palmer, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.15	5.80	5.80	6.2	5.95	5.45	5.02	4.90	4.75	4.85	5.20	5.12
2	5.9	5.60	5.57	6.0	5.75	5.62	4.98	4.93	4.77	4.90	5.22	5.12
3	6.55	5.63	5.40	5.95	5.62	5.42	4.98	4.87	4.77	5.08	5.22	5.12
4	6.25	5.70	5.53	6.1	5.58	5.30	5.08	4.85	4.75	5.00	5.25	5.12
5	6.0	5.50	5.57	5.98	5.52	5.25	5.20	4.87	4.70	4.95	5.20	5.12
6	7.25	5.47	6.6	5.82	5.42	5.20	5.18	4.85	4.65	4.95	5.12	5.12
7	8.2	5.53	7.3	5.82	5.42	6.6	5.02	4.85	4.65	4.82	5.05	5.12
8	8.5	5.73	7.25	5.72	5.38	5.78	5.12	4.85	4.67	4.85	5.00	5.20
9	6.85	5.67	7.6	5.75	5.32	5.52	4.98	4.90	4.73	4.85	5.35	5.12
10	6.45	5.67	8.4	5.72	5.30	5.35	5.10	5.03	4.67	4.82	6.3	5.15
11	6.4	5.77	7.25	6.4	5.30	5.30	5.05	4.93	4.67	4.85	5.65	5.12
12	8.5	.....	6.85	6.05	5.30	5.20	5.00	4.93	4.67	5.00	5.52	5.08
13	6.75	.....	7.05	5.80	5.28	5.15	5.00	4.93	4.67	5.05	6.1	5.18
14	6.35	.....	7.5	5.68	5.22	5.10	5.00	4.87	4.75	4.95	6.1	5.25
15	6.25	.....	7.15	5.58	5.22	5.12	5.00	4.77	4.67	4.95	5.78	5.25
16	6.85	.....	6.65	5.52	5.30	5.12	4.95	4.77	4.70	4.90	5.50	5.28
17	9.0	.....	6.15	5.52	5.32	5.10	4.95	4.75	4.70	4.85	5.40	5.22
18	9.8	.....	5.97	5.52	5.38	5.08	4.95	4.75	4.78	4.90	5.35	5.18
19	7.45	.....	6.15	5.58	5.30	5.08	4.90	4.13	4.75	4.95	5.38	5.18
20	7.1	8.6	5.97	6.0	5.22	5.10	4.95	4.67	4.75	5.15	6.1	5.18
21	8.0	6.75	5.87	5.42	5.22	5.32	4.95	4.65	4.72	5.25	6.1	5.18
22	8.0	7.25	5.83	5.52	5.78	5.18	4.90	4.83	4.75	5.35	5.50	5.18
23	7.7	6.35	5.97	6.4	5.50	5.10	4.90	4.97	4.80	5.42	5.32	5.28
24	7.15	6.05	6.55	6.2	5.42	5.08	5.00	4.95	4.80	5.52	5.25	5.52
25	6.65	5.73	11.4	5.70	5.32	5.18	4.92	4.95	4.75	5.60	5.20	5.48
26	6.4	5.37	8.2	5.52	5.30	5.68	4.87	4.93	4.80	5.48	5.18	5.35
27	6.35	5.83	9.4	9.0	5.40	5.32	4.87	4.87	4.80	5.32	5.18	5.25
28	6.25	5.97	8.3	8.4	7.4	5.10	4.97	4.90	4.85	5.20	5.20	5.18
29	6.25	.....	7.1	7.3	6.15	5.08	4.90	4.90	4.75	5.18	5.15	5.25
30	6.15	.....	6.35	6.3	5.65	5.10	4.87	4.85	4.75	5.20	5.12	5.18
31	6.0	.....	6.25	.....	5.48	.....	4.87	4.83	.....	5.18	.....	5.18

NOTE.—Discharge relation affected by ice from about Feb. 3 to Mar. 10.

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Daily discharge, in second-feet, of Cattaraugus Creek at Versailles, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,230	794	.....	1,510	1,120	508	191	135	85	118	300	248
2	907	586	.....	1,180	838	683	171	148	91	135	315	248
3	1,920	.....	.....	1,120	683	479	171	124	91	224	315	248
4	1,380	.....	.....	1,340	639	375	224	118	85	180	338	248
5	1,030	.....	.....	1,150	576	338	300	124	70	158	300	248
6	3,630	.....	.....	927	479	300	287	118	55	158	248	248
7	6,820	.....	.....	927	479	2,330	191	118	55	107	208	248
8	7,900	.....	.....	800	443	875	248	118	61	118	180	300
9	2,570	.....	.....	875	392	576	171	135	79	118	418	248
10	1,720	.....	.....	800	375	418	235	196	61	107	1,700	268
11	1,630	.....	3,630	1,900	375	375	208	148	61	118	718	248
12	7,900	.....	2,570	1,260	375	300	180	148	61	180	576	224
13	2,340	.....	3,070	900	360	268	180	148	61	208	1,340	287
14	1,540	.....	4,400	752	315	235	180	124	85	158	1,340	338
15	1,380	.....	3,340	639	315	248	180	91	61	158	875	338
16	2,570	.....	2,120	576	375	248	158	91	70	135	555	360
17	9,700	.....	1,230	576	392	235	158	85	70	118	460	315
18	12,500	.....	993	576	443	224	158	85	94	135	418	287
19	4,240	.....	1,230	639	375	224	135	79	85	158	443	287
20	3,200	.....	993	1,180	315	235	158	61	85	268	1,340	287
21	6,100	.....	873	479	315	392	158	55	76	338	1,340	287
22	6,100	.....	828	576	875	287	135	110	85	418	555	287
23	5,060	.....	993	1,900	555	235	135	164	100	479	392	360
24	3,340	.....	1,920	1,510	479	224	180	158	100	576	338	576
25	2,120	.....	18,300	775	392	287	144	158	85	660	300	536
26	1,630	.....	7,640	576	375	752	124	148	100	536	287	418
27	1,540	.....	11,100	10,800	460	392	124	124	100	392	287	338
28	1,380	.....	8,040	8,840	4,630	235	164	135	118	300	300	287
29	1,380	.....	3,670	4,300	1,420	224	135	135	85	287	268	338
30	1,230	.....	1,800	1,700	718	235	124	118	85	300	248	287
31	1,030	.....	1,600	.....	536	.....	124	110	.....	287	.....	287

NOTE.—Channel shifted by floods; new rating curve used beginning Mar. 26, 1913.

Monthly discharge of Cattaraugus Creek at Versailles, N. Y., for 1913.

[Drainage area, 467 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	12,500	907	3,450	7.39	8.52	D.
February	.....	.....	750	1.61	1.68	D.
March	18,300	.....	3,060	6.55	7.55	D.
April	10,800	479	1,700	3.64	4.06	C.
May	4,630	315	659	1.41	1.63	B.
June	2,330	224	425	.910	1.02	B.
July	300	124	175	.375	.43	B.
August	196	55	123	.263	.30	B.
September	118	55	80	.170	.19	B.
October	660	107	246	.53	.61	B.
November	1,700	180	557	1.19	1.33	B.
December	576	224	307	.66	.76	B.
The year	18,300	55	966	2.07	28.08	

NOTE.—Discharge Feb. 3 to Mar. 10, inclusive, estimated by comparison with records on Genesee River, Allegheny River, and Little Tonawanda Creek.

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LITTLE TONAWANDA CREEK AT LINDEN, N. Y.

Location.—At the stone arch highway bridge in the village of Linden, 600 feet northeast of Erie Railroad station, and 3 miles above junction with Tonawanda Creek.

Records available.—July 8, 1912, to December 31, 1913.

Drainage area.—22.0 square miles (measured on topographic sheets of United States Geological Survey).

Gage.—Vertical staff on right-hand upstream abutment of bridge; lower 2 feet of enameled iron graduated to hundredths of a foot; upper 4 feet of bronze graduated to half-tenths. An auxiliary gage fastened to the right-hand downstream abutment of the bridge is used to check upper gage. Gage read daily, morning and evening, to half-tenths. Limits of use: Hundredths below 1.5, half-tenths from 1.5 to 2.5, and tenths above 2.5 feet.

Control.—A standard Francis weir has been constructed under the upstream side of the bridge, having a length of 2.01 feet and a height of 8 inches. When the water overtops this weir it flows over a 2-inch plank about 13 feet long, including the 2 feet of weir. The weir was carried away by a floating tree on March 25, 1913, and was duplicated June 20, 1913.

Discharge measurements.—High-water measurements made from a cable and car 1,000 feet above weir; low-water measurements made by wading above weir.

Floods.—Flood of March, 1913, reached maximum stage at noon March 25, with a discharge of 1,300 second-feet, or 59 second-feet per square mile of drainage area. These figures are based on hourly gage heights recorded by the gage observer.

Accuracy.—At gage height 0.69, or below, flow is confined to weir. During such stages the accuracy of the data will be the accuracy of a properly constructed Francis weir. For stages above gage height 0.69 weir has been rated with a current meter, and data for such stages should also be excellent. Good rating curve of weir in its damaged condition obtained by current-meter measurements.

Discharge measurements of Little Tonawanda Creek at Linden, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 18	C. S. De Golyer	5.90	601	Jan. 22	C. S. De Golyer	1.90	74.4
18	do	6.28	672	Mar. 27	do	[a] 14.46	581
18	do	5.80	572	27	do	[a] 13.24	377
19	do	2.67	143	Apr. 1	do	[a] 9.94	41.0
19	do	2.43	119	1	do	[a] 9.93	41.5
20	do	2.31	107	May 6	C. C. Covert	[a] 9.25	14.4
20	do	2.76	150	June 18	C. S. De Golyer	[a] 8.74	2.38
20	do	2.85	156	21[b]	do	.70	3.73
22	do	[c] 1.89	76.9	21[b]	do	.70	3.55
22	do	1.86	72.4	Aug. 14[b]	G. H. Canfield	.24	0.55

[a] Gage height referred to datum 10 feet below that used for weir in its undamaged condition.
[b] Measurement made by wading.
[c] Gage height variable during this measurement. Give more weight to other measurements of same date.

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Daily gage height, in feet, of Little Tonawanda Creek at Linden, N. Y., for 1913.

[C. L. Schenck, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.28	1.14	1.10	9.95	9.80	8.94	0.51	0.27	0.23	0.22	0.27	0.73
2	1.22	1.22	1.03	9.74	9.62	9.36	.48	.24	.22	.22	.26	.71
3	1.5	1.18	1.06	9.82	9.48	9.06	.48	.24	.23	.21	.27	.72
4	1.08	1.18	1.08	10.15	9.38	8.96	.46	.30	.26	.21	.28	.72
5	1.30	.....	1.08	9.91	9.29	8.90	.71	.26	.24	.20	.26	.71
6	1.75	.....	1.03	9.76	9.23	8.89	.56	.27	.23	.20	.26	.69
7	3.2	.....	1.02	9.72	9.14	8.93	.50	.28	.22	.20	.26	.72
8	2.4	.....	1.02	9.68	9.12	8.94	.45	.24	.22	.18	.26	.80
9	1.6	.....	1.09	9.57	9.09	8.88	.44	.24	.21	.18	.56	.72
10	1.6	.....	2.5	9.54	9.04	8.84	.42	.39	.20	.20	.90	.73
11	2.2	.....	2.7	10.7	9.02	8.84	.42	.32	.19	.23	.72	.69
12	3.7	.....	2.4	9.89	9.00	8.82	.42	.26	.19	.24	.60	.72
13	2.0	.94	2.8	9.71	8.98	8.80	.40	.25	.19	.21	.64	.80
14	1.8	.93	4.4	9.58	8.96	8.78	.37	.24	.18	.20	.73	.87
15	1.5	.92	3.2	9.48	8.94	8.76	.37	.23	.18	.20	.72	.84
16	2.8	.98	1.95	9.42	8.98	8.76	.36	.22	.18	.21	.66	.79
17	6.5	.94	1.5	9.32	8.96	8.73	.36	.22	.20	.21	.64	.79
18	5.7	.92	1.55	9.26	9.00	8.73	.38	.21	.27	.22	.62	.78
19	2.6	.94	1.65	9.35	8.94	a 8.72	.36	.20	.22	.22	.70	.74
20	2.5	1.6	1.65	9.20	8.90	.....	.54	.18	.21	.32	1.16	.72
21	3.4	1.9	1.65	9.12	8.88	.70	.42	.18	.26	.27	.94	.71
22	1.85	2.4	1.36	9.13	9.10	.65	.34	.22	.28	.23	.80	.70
23	2.0	1.55	1.22	10.0	8.99	.56	.33	.26	.22	.22	.86	.74
24	2.4	1.47	2.3	9.80	8.95	.52	.36	.24	.21	.27	.84	.82
25	1.6	1.30	.....	9.49	8.92	.52	.39	.26	.21	.33	.85	.86
26	1.5	1.16	a13.1	9.34	8.88	.50	.34	.24	.22	.32	.82	.79
27	1.7	1.16	14.6	9.84	8.90	.80	.33	.22	.20	.30	.80	.74
28	1.36	1.12	10.9	13.7	10.05	.73	.34	.22	.20	.28	.76	.79
29	1.27	.....	10.8	10.3	9.39	.61	.32	.42	.20	.26	.74	.75
30	1.29	.....	10.45	10.1	9.11	.56	.30	.28	.19	.29	.74	.79
31	1.5	.....	10.3	.....	9.00	.....	.24	124	.....	.28	.....	.80

a All gage heights from Mar. 26 to June 19, while weir was damaged, referred to a datum 10.00 feet lower than datum of regular gage. Limits of use during this period: hundredths below 10.0, half-tenths from 10.0 to 11.0 and tenths above 11.0 feet.

Daily discharge, in second-feet, of Little Tonawanda Creek at Linden, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	26.2	18.1	16	42	35	6.1	2.18	0.82	0.63	0.59	0.82	4.1
2	22.5	22.5	13.2	33	28	18	1.99	.68	.59	.59	.77	3.7
3	43.0	20.2	14.4	36	22	9.0	1.99	.68	.63	.55	.82	3.9
4	15.2	20.2	15.2	53	18	6.6	1.87	.96	.77	.55	.87	3.9
5	27.5	17.0	15.2	40	16	5.2	3.7	.77	.68	.51	.77	3.7
6	63	15.0	13.2	33	14	5.0	2.51	.82	.63	.51	.77	3.48
7	199	13.5	12.8	32	11	5.9	2.12	.87	.59	.51	.77	3.9
8	117	12.5	12.8	30	11	6.1	1.81	.68	.59	.43	.77	5.6
9	51	11.5	15.6	26	9.7	4.8	1.74	.68	.55	.43	2.51	3.9
10	51	10.5	126	25	8.5	4.1	1.62	1.45	.51	.51	8.4	4.1
11	99	10.0	144	88	8	4.1	1.62	1.07	.47	.63	3.9	3.48
12	261	9.8	117	40	7.5	3.7	1.62	.77	.47	.68	2.79	3.9
13	83	9.8	154	31	7	3.3	1.51	.72	.47	.55	3.07	5.6
14	67	9.5	360	26	6.6	3.0	1.34	.68	.43	.51	4.1	7.5
15	43	9.1	199	22	6.1	2.7	1.34	.63	.43	.51	3.9	6.6
16	154	11.2	79	20	7	2.7	1.28	.59	.43	.55	3.21	5.3
17	711	9.8	43	17	6.6	2.3	1.28	.59	.51	.55	3.07	5.3
18	567	9.1	47	15	7.5	2.3	1.39	.55	.82	.59	2.93	5.1
19	135	9.8	55	18	6.1	2.2	1.28	.51	.59	.59	3.60	4.2
20	126	51	55	13	5.2	2.8	2.38	.43	.55	1.07	19.1	3.9
21	223	75	55	11	4.8	3.6	1.62	.43	.77	.82	9.7	3.7
22	71	117	32	11	10	3.14	1.17	.59	.87	.63	8.1	3.6
23	83	47	22.5	45	7.3	2.51	1.12	.77	.59	.59	7.2	4.2
24	117	40.6	108	35	6.4	2.25	1.28	.68	.55	.82	6.6	6.1
25	51	27.5	1,070	23	5.7	2.25	1.45	.77	.55	1.12	6.9	7.2
26	43	19.1	357	17	4.8	2.12	1.17	.68	.59	1.07	6.1	5.3
27	59	19.1	606	37	5.2	5.6	1.12	.59	.51	.96	5.6	4.2
28	32	17.0	104	450	48	4.1	1.17	.59	.51	.87	4.6	5.3
29	25.6	.....	96	62	19	2.86	1.07	1.62	.51	.77	4.2	4.4
30	26.9	.....	71	50	10	2.51	0.96	.87	.47	.91	4.2	5.3
31	43	.....	62	.....	7.5	.....	0.82	.68	.....	.87	.....	5.6

NOTE.—Discharge Feb. 5–12 estimated by interpolation and comparison with records of Genesee River at St. Helena. Discharge Mar. 25 to June 20, while the weir was damaged, computed from a rating curve well defined by 6 discharge measurements.

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Monthly discharge of Little Tonawanda Creek at Linden, N. Y., for 1913.

[Drainage area, 22.0 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	711	15.2	117	5.32	6.13	A.
February	117	9.1	23.7	1.08	1.12	A.
March	1,070	12.8	132	6.00	6.92	B.
April	450	11.0	46.0	2.09	2.33	A.
May	48	4.8	11.9	.541	.62	A.
June	18	2.0	4.33	.197	.22	A.
July	3.7	.82	1.60	.073	.08	A.
August	1.62	.43	.749	.034	.04	A.
September	.87	.43	.575	.026	.03	A.
October	1.12	.43	.672	.031	.04	A.
November	19.1	.77	4.34	.197	.22	A.
December	7.5	3.48	4.71	.214	.25	A.
The year	1,070	.43	29.2	1.33	18.00	

STREAMS TRIBUTARY TO LAKE ONTARIO.

GENESEE RIVER AT ST. HELENA, N. Y.

Location.—At steel highway bridge, about 6 miles above mouth of Silver Lake outlet, 9½ miles above Canaseraga Creek, and 5½ miles below village of Portageville and site of proposed storage dam of State of New York Conservation Commission.

Records available.—August 14, 1908, to December 31, 1913. Published also in annual reports of the New York State engineer and surveyor and State of New York Conservation Commission.

Drainage area.—1,030 square miles.

Gages.—Chain gage, fastened to upstream side of middle span of bridge; read twice daily to hundredths. Limits of use: Hundredths below 2.5 until March 10, and below 3.0 after that date, half-tenths from these limits to 4.0, and tenths above 4.0. Since August 24, 1911, a Gurley self-recording gage with intake pipe to the well a few feet downstream from the chain gage; datum of recording gage same as that of chain gage, but slope of water surface makes readings different. Gage heights from self-recording gage used to hundredths.

Control.—Gravel and rocks; shifting.

Discharge measurements.—At high stages made from the bridge; at low and medium stages either by wading or from bridge.

Winter flow.—Discharge relation usually but slightly affected by ice; determination of winter discharge considered good.

Floods.—Highest stage during flood of March 25–30, 1913, 12.0 feet, read by chain gage at 8 a. m. March 26. Automatic gage was not recording correctly during this period because intake pipe was clogged by gravel, but the records indicate crest of flood from 3 to 5 a. m. March 26, with a somewhat higher stage than that recorded at 8 a. m. on same date. The discharge corresponding to a gage height of 12.0 feet was 37,800 second-feet, or 36.7 second-feet per square mile of drainage area.

Accuracy.—Discharge rating curve well defined; data as published considered excellent.

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Discharge measurements of Genesee River at St. Helena, N. Y., in 1913.

Date.	Hydrographer.	Gage height.[a]	Discharge.	Date.	Hydrographer.	Gage height.[a]	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Feb. 12[b]	C. C. Covert	4.61	617	June 23[d]	C. S. DeGolyer	2.62	300
21[b]	C. S. De Golyer	4.81	1,220	24[d]	do	2.53	256
Mar. 12	C. C. Covert	4.96	3,315	Aug. 14[d]	G. H. Canfield	1.82	33.2
28	C. S. De Golyer	[c]8.41	13,400	14[d]	do	1.82	33.0
28	do	[c]7.73	10,300	Oct. 30	R. S. Barnes	2.93	487
Apr. 2	do	[c]4.59	2,270				

[a] From automatic gage except as noted.
[b] Measurement made under complete ice cover.
[c] From chain gage on bridge.
[d] Measurement made by wading.

Daily gage height, in feet, of Genesee River at St. Helena, N. Y., for 1913.

[Herman Piper, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.75	3.54	3.7	5.2	4.9	3.25	2.32	2.01	2.06	2.02	2.75	2.81
2	3.41	2.85	3.25	4.5	4.5	3.6	2.27	2.08	2.00	2.00	2.67	2.76
3	3.84	2.84	3.15	4.4	4.2	3.3	2.25	1.90	1.97	2.20	2.62	2.73
4	4.92	2.95	2.85	4.7	3.9	3.1	2.11	2.12	1.94	2.18	2.68	2.72
5	4.25	2.76	2.9	5.8	3.75	2.97	2.27	2.00	1.93	1.72	2.56	2.70
6	4.23	2.74	2.8	4.7	3.55	2.86	2.28	2.01	1.93	2.19	2.51	2.66
7	6.40	2.7	2.7	4.5	3.4	3.6	2.37	2.01	1.83	2.16	2.48	2.66
8	7.71	2.6	2.6	4.3	3.3	3.6	2.24	2.00	1.97	2.05	2.45	2.73
9	6.96	2.6	2.85	4.2	3.15	3.1	2.21	2.00	1.92	1.85	2.72	2.75
10	5.14	4.2	6.0	4.0	3.1	2.88	2.16	1.89	1.90	2.12	5.45	2.71
11	5.06	4.4	6.0	4.4	3.05	2.86	2.16	2.13	1.88	1.96	4.20	2.77
12	7.22	4.7	5.4	4.5	3.1	2.77	2.19	2.08	1.89	2.26	3.65	2.77
13	5.81	.....	5.38	4.1	3.0	2.62	2.17	1.99	1.87	2.40	3.46	2.75
14	4.69	4.48	5.82	3.85	2.88	2.54	2.23	1.99	1.87	2.11	3.77	2.78
15	4.29	4.46	5.88	3.8	2.94	2.52	2.19	1.98	.....	2.02	3.93	2.91
16	4.64	4.49	4.93	3.65	2.78	2.56	2.19	1.92	.....	2.09	3.63	2.90
17	6.98	4.61	3.95	3.5	2.84	2.36	2.15	1.87	.....	1.96	3.47	2.79
18	8.07	4.38	3.58	3.4	2.76	2.24	2.12	1.96	.....	2.15	3.39	2.74
19	6.62	4.40	3.67	3.3	2.68	2.22	2.14	1.98	.....	1.81	3.29	2.70
20	5.34	4.51	3.52	3.3	2.72	2.45	2.06	1.94	.....	2.35	3.53	2.56
21	6.48	4.81	3.51	3.1	2.68	3.2	2.23	1.95	.....	2.46	3.52	2.62
22	5.01	4.44	3.47	2.95	3.2	2.92	2.13	1.87	.....	2.61	3.36	2.62
23	4.60	4.27	3.22	3.3	3.15	2.72	2.12	1.99	.....	2.62	3.19	2.65
24	6.17	3.1	3.75	4.2	3.1	.....	2.06	1.88	.....	2.40	3.12	2.73
25	4.85	3.0	11.2	3.65	3.1	2.47	2.09	2.10	.....	2.59	3.06	3.06
26	4.36	2.85	11.2	3.4	2.98	2.61	2.19	2.01	.....	2.70	2.99	2.91
27	4.24	2.75	10.8	3.4	3.05	2.58	2.03	2.01	.....	3.64	2.93	2.73
28	3.89	2.7	8.1	9.5	5.4	2.56	2.17	1.89	.....	3.18	2.87	2.74
29	3.68	.....	6.2	8.0	4.5	2.40	2.06	2.08	.....	2.89	2.82	2.78
30	3.47	.....	5.5	6.0	3.8	2.42	2.14	2.07	.....	2.82	2.80	2.82
31	3.50	.....	5.4	.....	3.5	.....	2.07	1.89	.....	2.82	.....	2.87

NOTE.—Gage heights affected by ice Feb. 10–23, inclusive. Gage heights Feb. 7–12, Feb. 24 to Mar. 12, Mar. 25 to June 23, Oct. 1–23, and Dec. 28–31 (all inclusive) are means of two readings per day on chain gage. From Mar. 25 to June 23 intake pipe of automatic gage well was covered with gravel, rendering the automatic gage record useless. Remainder of gage heights computed as means of 24 hourly gage heights from automatic gage record.

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Daily discharge, in second-feet, of Genesee River at St. Helena, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,580	1,300	1,340	3,380	2,800	666	169	71	84	69	372	408
2	1,140	612	875	2,130	2,130	1,000	150	90	66	64	327	378
3	1,710	605	785	1,980	1,710	708	144	46	61	114	302	360
4	3,590	689	560	2,450	1,340	548	98	101	55	109	333	355
5	2,330	548	590	4,680	1,160	461	150	68	53	20	273	344
6	2,300	535	530	2,450	950	395	154	71	53	111	249	322
7	7,690	474	474	2,130	800	1,000	188	71	35	103	235	322
8	12,800	424	424	1,840	708	1,000	140	68	61	76	222	360
9	9,610	424	560	1,710	586	548	130	68	50	36	255	372
10	4,100	410	5,990	1,460	548	406	114	44	46	92	4,360	349
11	3,910	400	5,170	1,980	514	395	114	104	43	56	1,950	384
12	10,600	400	3,790	2,130	548	344	123	90	44	132	1,180	384
13	5,850	617	4,210	1,580	480	268	117	66	41	178	966	372
14	3,120	520	5,240	1,280	406	233	136	66	41	90	1,330	390
15	2,390	460	5,390	1,220	443	224	123	64	.....	69	1,550	474
16	3,030	400	3,260	1,060	349	241	128	50	.....	85	1,160	467
17	9,680	340	3,300	900	383	164	110	41	.....	56	977	396
18	14,600	300	1,100	800	338	126	101	59	.....	100	890	366
19	8,430	300	1,200	708	296	120	107	64	.....	29	791	344
20	4,580	300	1,030	708	317	217	84	55	.....	161	1,040	273
21	7,950	1,220	1,020	548	296	624	136	57	.....	201	1,030	302
22	3,790	1,050	977	449	624	430	104	41	.....	283	860	302
23	2,950	900	728	708	586	317	101	66	.....	268	701	317
24	6,940	740	1,300	1,710	548	260	84	43	.....	200	638	360
25	3,440	660	31,100	1,060	548	231	92	95	.....	287	588	588
26	2,510	560	31,100	800	468	297	123	71	.....	344	532	474
27	2,310	502	27,900	800	514	282	76	71	.....	1,170	488	360
28	1,780	474	11,970	19,000	3,790	273	117	44	.....	692	447	328
29	1,480	.....	5,680	11,600	2,130	200	84	90	.....	460	415	349
30	1,210	.....	4,000	5,170	1,220	209	107	87	.....	415	402	372
31	1,250	.....	3,790	.....	900	.....	87	44	.....	415	.....	401

NOTE.—Discharge Feb. 10–23 estimated from measurements made Feb. 13 and Feb. 21 and hydrograph comparison with records of Genesee River at Rochester. New rating curve used beginning Mar. 13 1913, probably a backwater curve up to some time during the flood, when it became the open-water curve.

Monthly discharge of Genesee River at St. Helena, N. Y., for 1913.

[Drainage area, 1,030 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	14,600	1,140	4,800	4.66	5.37	A.
February	1,300	a 300	577	.560	.58	C.
March	31,100	424	5,330	5.17	5.96	B.
April	19,000	449	2,610	2.53	2.82	B.
May	3,790	296	917	.890	1.03	A.
June	1,000	120	406	.394	.44	B.
July	188	76	119	.116	.13	A.
August	104	41	66.6	.065	.07	B.
September	.....	.....	50	.049	.05	C.
October	1,170	20	208	.202	.23	A.
November	4,360	222	832	.808	.90	A.
December	588	273	373	.362	.42	A.
The year	31,100	20	1,370	1.33	18.00	

a Estimated.

NOTE.—Discharge Sept. 15–30, inclusive, estimated by comparison with records of Genesee River at Jones Bridge and Rochester.

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GENESEE RIVER AT JONES BRIDGE, NEAR MOUNT MORRIS, N. Y.

Location.—At highway bridge known as Jones Bridge, about 5 miles below the village of Mount Morris, 6 miles by river above the village of Geneseo, 1¾ miles below the inflow of Canaseraga Creek, and about 1¾ miles above the mouth of Beads Creek.

Records available.—May 22, 1903, to April 30, 1906; August 12, 1908, to December 31, 1913. Data also in annual reports of the State engineer and surveyor and the State of New York Conservation Commission.

Drainage area.—1,410 square miles.

Gage.—Chain, fastened to upstream side of highway bridge; read daily morning and evening to hundredths. Limits of use: Hundredths below 3.5, half-tenths from 3.5 to 5.0, and tenths above 5.0 feet.

Control.—Sandy clay; likely to shift, but, as shown by measurements, fairly permanent in recent years.

Discharge measurements.—Made at all stages from footbridge erected on the outriggers of the bridge.

Winter flow.—Discharge relation for the winter months considerably affected by ice. Volume of flow during the winter months determined chiefly by comparison with the flow of the Genesee at Rochester and at St. Helena.

Floods.—The crest of the flood of March 25–30, 1913, reached gage height 27.6 feet, as shown by the observer's gage readings and later verified by engineers of the Geological Survey from high-water marks. The corresponding discharge of 19,300 second-feet, or 13.7 second-feet per square mile of drainage area, was much less than the maximum rate of run-off of Genesee River at St. Helena. This apparent discrepancy is explained by the large amount of river storage between the two stations, which also accounts for the much longer duration of the high stage at Jones Bridge, the mean discharge at the latter station for the two days, March 26 and 27, being 19,200 second-feet, or 13.6 second-feet per square mile.

Accuracy.—Discharge curve well developed; data as published for open-water periods probably good.

Discharge measurements of Genesee River at Jones Bridge, near Mount Morris, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Feb. 20[a]	C. S. De Golyer	6.96	672
Apr. 28	do	22.62	14,400
June 25	do	4.44	467

[a] Measurement made under complete ice cover.

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Daily gage height, in feet, of Genesee River at Jones Bridge, near Mount Morris, N. Y., for 1913.

[J. W. Trewer, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7.7	6.5	.....	11.8	14.0	5.9	4.2	3.7	3.41	3.28	4.7	4.7
2	6.4	6.2	.....	9.4	10.1	6.8	4.1	3.45	3.55	3.32	4.7	4.7
3	6.8	6.2	.....	8.6	8.6	6.0	4.25	3.20	3.5	3.30	4.5	4.6
4	10.8	6.0	.....	9.1	7.7	5.7	3.85	3.55	3.48	3.45	4.40	4.5
5	8.8	6.2	.....	11.7	7.0	5.3	3.8	3.5	3.40	3.46	4.35	4.5
6	8.6	6.7	.....	9.6	6.6	5.1	3.8	3.49	3.47	3.5	4.3	4.5
7	16.2	.....	.....	8.8	6.1	5.1	4.0	3.30	3.36	3.7	4.35	4.5
8	18.9	.....	.....	8.3	5.9	6.2	3.85	3.38	3.30	3.7	4.55	4.5
9	20.6	.....	.....	7.9	5.8	5.6	3.9	3.36	3.31	3.9	5.4	4.6
10	13.8	.....	17.6	7.5	5.5	5.1	3.85	3.37	3.32	3.5	11.6	4.5
11	10.8	.....	19.6	7.7	5.4	4.8	3.7	3.34	3.34	3.40	8.0	4.6
12	17.3	.....	18.0	8.8	5.3	4.7	3.85	3.42	3.36	3.40	7.2	4.65
13	16.6	.....	12.4	7.6	5.2	4.6	3.7	3.47	3.36	3.95	6.8	4.7
14	11.1	.....	13.8	7.0	5.1	4.45	3.8	3.40	3.31	3.9	6.4	4.65
15	9.4	.....	14.6	6.8	5.0	4.35	3.8	3.26	3.26	3.8	6.7	4.85
16	9.2	.....	12.6	6.6	5.0	4.3	3.8	3.36	3.30	3.75	6.0	4.95
17	17.4	.....	8.6	6.3	4.95	4.35	3.6	3.18	3.30	3.44	5.8	4.7
18	23.5	.....	7.3	5.9	4.9	4.15	3.65	3.04	3.30	3.5	5.8	4.6
19	22.5	.....	7.3	5.8	4.9	4.25	3.6	3.14	3.34	3.48	5.7	4.5
20	15.8	7.0	6.9	5.7	4.9	.....	3.6	3.18	3.34	3.7	5.6	4.5
21	18.4	.....	6.8	5.6	4.8	.....	3.7	3.14	3.18	4.15	5.6	4.5
22	13.2	.....	6.7	5.5	5.1	.....	3.75	3.20	3.28	4.25	5.7	4.5
23	10.3	.....	6.3	5.7	5.5	.....	3.65	3.17	3.22	4.35	5.2	4.35
24	16.0	.....	6.4	7.6	5.3	.....	3.5	3.22	3.54	4.35	5.2	4.35
25	11.2	.....	22.2	6.6	5.4	.....	3.5	3.11	3.31	4.2	5.2	4.9
26	9.5	.....	27.5	6.0	5.1	4.55	3.6	3.45	3.44	4.5	4.96	4.8
27	9.0	.....	27.5	5.9	4.8	4.6	3.55	3.6	3.36	5.0	4.95	5.8
28	8.0	.....	26.6	22.5	10.0	4.75	3.6	4.0	3.40	5.3	4.9	6.3
29	7.1	.....	23.6	25.6	9.6	4.4	3.55	3.7	3.25	5.2	4.8	.....
30	6.7	.....	17.4	21.4	7.3	4.15	3.48	3.7	3.48	4.9	4.75	.....
31	6.7	.....	12.7	.....	6.5	.....	3.55	3.30	.....	4.7	.....	.....

NOTE.—Discharge relation affected by ice about Feb. 5 to Mar. 9, and Dec. 27–31.

Daily discharge, in second-feet, of Genesee River at Jones Bridge, near Mount Morris, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,210	1,500	.....	5,020	6,760	1,180	364	198	126	98	572	572
2	1,450	1,340	.....	3,330	3,820	1,670	328	136	160	106	572	572
3	1,670	1,340	.....	2,790	2,790	1,230	383	82	148	102	484	528
4	4,310	1,230	.....	3,120	2,210	1,060	244	160	143	136	442	484
5	2,920	.....	.....	4,940	1,790	860	228	148	124	138	422	484
6	2,790	.....	.....	3,470	1,560	760	228	148	141	148	402	484
7	8,630	.....	.....	2,920	1,280	760	294	102	115	198	422	484
8	11,000	.....	.....	2,600	1,180	1,340	244	120	102	198	506	484
9	12,500	.....	.....	2,340	1,120	1,010	260	115	104	260	910	528
10	6,600	.....	9,840	2,090	960	760	244	117	104	148	4,870	484
11	4,310	.....	11,600	2,210	910	618	198	111	111	124	2,400	528
12	9,570	.....	10,200	2,920	860	572	244	129	115	124	1,910	550
13	8,970	.....	5,480	2,150	810	528	198	141	115	277	1,670	572
14	4,520	.....	6,600	1,790	760	463	228	124	104	260	1,450	550
15	3,330	.....	7,270	1,670	710	422	228	94	94	228	1,620	641
16	3,190	.....	5,640	1,560	710	402	228	115	102	213	1,230	687
17	9,660	.....	2,790	1,400	687	422	172	79	102	134	1,120	575
18	15,200	.....	1,970	1,180	664	346	185	58	102	148	1,120	528
19	14,200	.....	1,970	1,120	664	383	172	72	111	143	1,060	484
20	8,290	672	1,730	1,060	664	383	172	79	111	198	1,010	484
21	10,600	.....	1,670	1,010	618	402	198	72	79	346	1,010	484
22	6,120	.....	1,620	960	760	402	213	82	98	383	1,060	484
23	3,960	.....	1,400	1,060	960	422	185	77	86	422	810	422
24	8,460	.....	1,450	2,150	860	442	148	86	158	422	810	422
25	4,590	.....	14,000	1,560	910	463	148	68	104	364	810	664
26	3,400	.....	19,200	1,230	760	506	172	136	134	484	687	618
27	3,050	.....	19,200	1,180	618	528	160	172	115	710	687	.....
28	2,400	.....	18,300	14,200	3,750	595	172	294	124	860	664	.....
29	1,850	.....	15,300	17,300	3,470	442	160	198	92	810	618	.....
30	1,620	.....	9,660	13,300	1,970	346	143	198	143	664	595	.....
31	1,620	.....	5,720	.....	1,500	.....	160	102	.....	572	.....	.....

NOTE.—Discharge June 20–25 interpolated.

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Monthly discharge of Genesee River at Jones Bridge, near Mount Morris, N. Y., for 1913.

[Drainage area, 1,410 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	15,200	1,450	5,900	4.18	4.82	B.
February	.....	.....	881	.625	.65	D.
March	19,200	.....	5,840	4.14	4.77	D.
April	17,300	960	3,450	2.45	2.73	B.
May	6,760	618	1,520	1.08	1.24	A.
June	1,670	346	657	.466	.52	A.
July	383	143	216	.153	.18	A.
August	287	58	123	.087	.10	B.
September	162	79	116	.082	.09	B.
October	860	98	304	.216	.25	A.
November	4,870	402	1,060	.752	.84	A.
December	687	422	529	.375	.43	A.
The year	19,200	58	1,730	1.23	16.62	

NOTE.—Discharge Feb. 5 to Mar. 9 estimated from one discharge measurement and comparison with records at St. Helena and Rochester. Discharge Dec. 27-31 estimated by comparison with St. Helena and Rochester.

GENESEE RIVER AT ROCHESTER, N. Y.

Location.—At highway bridge known locally as Elmwood Avenue Bridge, at north end of South Park, 3½ miles above center of city of Rochester, 3¼ miles below mouth of Black Creek, and 7½ miles above mouth of river.

Records available.—February 9, 1904, to December 31, 1913. Data also in annual reports of the State engineer and surveyor and State of New York Conservation Commission. Elevation of water surface, measurements, and records of flow of Genesee River at Rochester during flood stages and low water previous to 1904 published in annual reports of the State engineer and surveyor, 1902, 1903, and 1904, and in Water-Supply Papers 24, 65, and 97.

Drainage area.—2,360 square miles.

Gage.—Gurley automatic water-stage register in pump house immediately below bridge on right bank installed in December, 1910. Prior to 1910 a staff gage bolted to the downstream end of first pier from right-hand abutment; read once daily. Elevation of zero of gage, 506.848 feet, Barge canal datum, and 245.591 feet, Rochester city datum.

Control.—Gravel, smooth; considered permanent.

Discharge measurements.—Made from bridge at which staff gage is attached. Prior to 1904, measurements and elevations of water surface taken in conjunction with measurements of water flowing over and around Johnson-Seymour dam in the city of Rochester.

Winter flow.—Affected by ice for short periods, though as a rule channel is open.

Floods.—Crest of flood of March 25–30, 1913, reached gage height 15.02 feet on the afternoon of March 28, the high-water mark being referenced by gage observer and later referred to gage datum by engineers of the Geological Survey. Corresponding discharge, 42,000 second-feet, or 17.8 second-feet per square mile of drainage area.

Accuracy.—Discharge rating curve well developed for all stages; published data considered good for periods of open water.

Cooperation.—Gage heights furnished by Rochester Light & Railway Co.

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Discharge measurements of Genesee River at Rochester, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Jan. 23	C. S. De Golyer	5.28	8,860	Apr. 3	C. S. De Golyer	4.03	5,620
Feb. 19[a]	do	1.72	963	6	do	2.51	2,480
Mar. 30	C. C. Covert	11.98	31,800	Nov. 1	R. S. Barnes	1.32	589
30	do	11.31	27,500				

[a] Measurement made by wading.

Daily gage height, in feet, of Genesee River at Rochester, N. Y., for 1913.

[G. A. Bailey, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.02	2.70	1.74	6.69	8.02	2.28	1.29	0.93	0.91	0.80	1.28	1.28
2	2.47	2.90	1.87	4.96	5.96	2.15	1.23	.90	.90	.81	1.25	1.25
3	2.34	2.47	2.18	5.07	4.12	2.38	1.18	.87	.88	.82	1.18	1.29
4	2.70	2.25	1.99	4.11	3.37	2.16	1.13	.85	.85	.80	1.20	1.27
5	3.58	2.13	1.89	4.45	2.98	1.96	1.14	.88	.85	.79	1.19	1.24
6	3.22	2.50	1.80	4.66	2.71	1.78	1.13	.88	.86	.79	1.15	1.23
7	4.07	2.91	1.83	4.02	2.49	1.62	1.08	.86	.80	.75	1.13	1.24
8	5.78	2.77	1.98	3.68	2.32	1.83	1.05	.85	.80	.84	1.08	1.18
9	7.02	2.52	1.63	3.42	2.18	2.08	1.08	.87	.83	.85	1.08	1.22
10	7.29	2.33	3.14	3.20	2.07	1.84	1.08	.88	.81	.91	1.37	1.23
11	5.11	2.41	5.60	3.33	1.97	1.67	1.08	.87	.80	.92	3.40	1.22
12	5.38	2.31	6.36	3.98	1.89	1.56	1.06	.87	.80	.90	2.71	1.21
13	6.84	2.22	6.32	3.77	1.85	1.49	1.04	.85	.79	.86	2.09	1.25
14	5.80	2.31	6.07	3.27	1.80	1.43	.97	.87	.....	.82	1.83	1.26
15	4.54	1.76	6.46	2.96	1.73	1.38	.96	.86	.....	.90	1.93	1.31
16	3.86	1.71	6.14	2.75	1.69	1.32	1.02	.84	.73	.90	2.12	1.38
17	5.20	1.70	.....	2.59	1.67	1.30	1.02	.83	.79	.90	1.95	1.34
18	7.92	1.70	.....	2.42	1.66	1.30	1.00	.77	.78	.91	1.81	1.27
19	8.84	1.65	3.19	2.34	1.61	1.25	.97	.84	.76	.89	1.76	1.22
20	8.82	1.65	3.14	.....	1.57	1.22	.97	.81	.78	.87	1.70	1.19
21	7.76	1.90	3.02	2.12	1.53	1.24	.98	.80	.79	.84	1.81	1.13
22	6.98	2.32	2.86	2.05	1.51	1.35	.97	.83	.79	.94	1.90	1.17
23	5.32	2.66	2.68	2.11	1.65	1.53	.98	.83	.80	.96	1.79	1.19
24	5.06	3.06	2.57	2.75	1.85	1.43	.97	.81	.81	1.10	1.64	1.22
25	5.70	2.52	5.05	2.80	1.80	1.38	.96	.81	.83	1.12	1.59	1.42
26	4.52	2.06	9.00	2.52	1.75	1.50	.93	.82	.86	1.12	1.52	1.59
27	3.89	1.86	11.94	2.26	1.68	1.58	.92	.81	.83	1.21	1.48	1.30
28	6.66	1.75	14.74	3.62	1.91	1.73	.94	.90	.83	1.61	1.39	1.24
29	3.09	.....	14.22	7.35	3.94	1.63	.94	1.06	.79	1.67	1.41	1.25
30	2.80	.....	11.79	8.21	3.45	1.42	.93	.97	.77	1.44	1.34	1.27
31	2.69	.....	9.54	.....	2.69	.....	.94	.91	.....	1.30	.....	1.29

NOTE.—Gage heights affected by ice Feb. 6–20, inclusive. Mean daily gage height computed as mean of 24 hourly gage heights for each day. Gage heights Mar. 28–29 computed from hourly gage heights observed by an employee of the Rochester Railway and Light Co.

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Daily discharge, in second-feet, of Genesee River at Rochester, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,630	2,820	1,200	13,100	17,300	2,070	598	271	257	190	587	587
2	2,410	3,190	1,400	8,020	10,900	1,840	532	250	250	196	554	554
3	2,170	2,410	1,900	8,320	5,840	2,240	480	232	238	202	480	598
4	2,820	2,020	1,580	5,820	4,120	1,960	432	220	220	190	500	576
5	4,570	1,810	1,420	6,670	3,340	1,530	442	238	220	186	490	542
6	3,810	1,700	1,290	7,220	2,840	1,260	432	238	226	186	451	532
7	5,720	1,590	1,340	5,600	2,440	1,030	387	226	190	170	432	542
8	10,300	1,470	1,570	4,790	2,140	1,340	362	220	190	214	387	480
9	14,100	1,380	1,040	4,220	1,900	1,730	387	232	208	220	387	521
10	14,900	1,300	3,650	3,770	1,710	1,350	387	238	196	257	692	532
11	8,430	1,220	9,820	4,030	1,550	1,100	387	232	190	264	4,180	521
12	9,180	1,170	12,100	5,500	1,430	942	370	232	190	250	2,840	510
13	13,500	1,130	12,000	5,000	1,360	846	353	220	186	226	1,740	554
14	10,400	1,300	11,200	3,910	1,290	768	299	232	178	202	1,340	564
15	6,900	1,100	12,400	3,300	1,180	705	292	226	170	250	1,490	622
16	5,210	1,040	11,400	2,910	1,130	633	336	214	162	250	1,790	705
17	8,690	1,010	7,800	2,620	1,100	610	336	208	186	250	1,520	656
18	16,900	980	5,600	2,320	1,080	610	320	178	182	257	1,300	576
19	20,000	963	3,750	2,170	1,010	554	299	214	174	244	1,230	521
20	19,900	950	3,650	1,980	956	521	299	196	182	232	1,140	490
21	16,400	1,440	3,420	1,790	900	542	306	190	186	214	1,300	432
22	13,900	2,140	3,110	1,680	874	668	299	208	186	278	1,440	470
23	9,020	2,750	2,780	1,780	1,070	900	306	208	190	292	1,270	490
24	8,290	3,490	2,590	2,910	1,360	768	299	196	196	405	1,060	521
25	10,100	2,500	8,260	3,000	1,290	705	285	196	208	423	984	755
26	6,850	1,700	20,500	2,500	1,210	860	271	202	226	423	887	984
27	5,290	1,380	30,900	2,030	1,110	970	264	196	208	510	833	610
28	13,000	1,210	41,000	4,660	1,460	1,180	278	250	208	1,010	718	542
29	3,550	.....	39,100	15,100	5,410	1,040	278	370	186	1,100	742	554
30	3,000	.....	30,300	17,900	4,280	755	271	299	178	780	656	576
31	2,800	.....	22,300	.....	2,800	.....	278	257	.....	610	.....	598

Monthly discharge of Genesee River at Rochester, N. Y., for 1913.

[Drainage area, 2,360 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	20,000	1,630	8,830	3.74	4.31	A.
February	3,490	a 950	1,680	.712	.74	B.
March	41,000	1,040	10,000	4.24	4.89	B.
April	17,900	1,680	5,150	2.18	2.43	A.
May	17,300	874	2,790	1.18	1.36	A.
June	2,240	521	1,060	.449	.50	A.
July	598	264	350	.148	.17	A.
August	370	178	229	.097	.11	B.
September	257	162	199	.084	.09	B.
October	1,100	170	338	.143	.16	A.
November	4,180	387	1,110	.470	.52	A.
December	984	432	571	.242	.28	A.
The year	41,000	162	2,710	1.15	15.56	

a Estimated.

NOTE.—Discharge interpolated Mar. 17, 18, Apr. 20, and Sept. 14 and 15.

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CANADICE LAKE OUTLET NEAR HEMLOCK, N. Y.

Location.—In outlet at foot of lake, which discharges to Genesee River through Hemlock Lake outlet and Honeoye Creek.

Records available.—April, 1903, to December, 1913. Data also in annual reports of the New York State engineer and surveyor and the reports of the city engineer of Rochester, N. Y.

Drainage area.—12.6 square miles, of which 0.7 square mile is lake surface.

Gage.—Hook gage, in channel above gate.

Computation of discharge.—Outflow is measured over a standard thin-edged weir with a 5-foot crest and two end contractions, so arranged with needle timbers at the ends that the length may be increased to 14.96 feet with no end contractions during high water. The weir crest stands 3 feet above the stream channel and is never submerged by backwater. Two additional rectangular gates, each 1 foot square, with three complete contractions and a fourth partial contraction at the bottom, afford by-passes during high water. Depth of water on weir is read each morning to hundredths of a foot by means of the hook gage. Each change of the gates is also noted. Corrections are made for velocity of approach for the higher stages. All computations are made by the Francis formula.

Diversions.—No water is diverted from Canadice Lake above the station.

Regulation.—Outflow of lake at dam above weir controlled by the gates.

Winter flow.—Pool above weir is free from ice throughout winter.

Accuracy.—Observations and computations made with care; results should be very good.

Cooperation.—Data collected and furnished for publication by E. A. Fisher, city engineer, Rochester, N. Y.

Monthly discharge of Canadice Lake outlet near Hemlock, N. Y., for 1913.

[Drainage area, 12.6 square miles.]

Month.	Discharge in second-feet.		Run-off (depth in inches on drainage area).	Mean elevation of lake above low-water mark.
	Mean.	Per square mile.		
January	47.094	3.74	4.31	2.687
February	17.637	1.40	1.46	1.275
March	33.161	2.63	3.03	1.897
April	29.264	2.32	2.59	2.912
May	19.122	1.52	1.75	2.657
June	6.859	.544	.61	2.517
July	6.500	.516	.59	2.276
August	4.529	.359	.41	1.500
September	4.451	.353	.39	.518
October	3.737	.296	.34	.341
November	3.964	.315	.35	.427
December	4,016	.319	.37	.389
The year	15.028	1.20	16.20	1.641

NOTE.—Terminal water surface for 1913 was 0.90 foot lower than for the previous year, corresponding to a draft on storage of 26,948,500 cubic feet or a discharge of 0.855 second-foot for the year.

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OWASCO OUTLET NEAR AUBURN, N. Y.

Location.—On farm of George Ridley, 3¾ miles below State dam at outlet of Owasco Lake, 2 miles below center of city of Auburn.

Records available.—November 17, 1912, to December 31, 1913.

Drainage area.—206 square miles (measured on United States Geological Survey topographic sheets).

Gage.—Gurley automatic water-stage register installed over concrete well 3½ feet square and 6 feet deep (inside dimensions). Gage well connected with river by 4-inch cast-iron pipe.

Control.—Gage heights registered by this gage controlled by low concrete weir situated a short distance below the gage. Crest of weir 1 foot wide; slopes of both upstream and downstream faces, ½ : 1. A small horizontal apron built on a level with bed of stream extends downstream 2½ feet from toe of dam. Left-hand end of dam for a distance of 50 feet has mean elevation of gage height 1.28 feet; remaining 50 feet of crest of dam is at gage height 2.12 feet.

Discharge measurements.—Made during low water by wading at a section directly opposite the gage, and from a cable and car at the same section in high water.

Winter flow.—Ice does not form to a sufficient extent to obstruct the control.

Diversions.—An average flow of about 10 second-feet is pumped from Owasco Lake for the municipal water supply of the city of Auburn; proportion returning to stream above gaging station not known.

Floods.—High water of March 25–30, 1913, reached gage height 4.6 feet, as determined from high-water marks by engineers of the Geological Survey. Corresponding discharge, 2,750 second-feet, or 13.3 second-feet per square mile of drainage area.

Accuracy.—Discharge measurements consistent; estimates excellent. The mean daily discharge as obtained from a gage height representing the mean of 24 hourly gage heights is subject to considerable error. The mean daily gage height is therefore not published and the mean daily discharge in the following table is the mean of 24 hourly discharges.

Discharge measurements of Owasco outlet near Auburn, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 14	C. S. De Golyer.....	3.44	1,010	Apr. 1	C. C. Covert.....	3.89	1,530
15	.....do.....	3.28	878	4	C. S. De Golyer.....	3.57	1,180
15	.....do.....	3.28	879	Aug. 16[a]	G. H. Canfield.....	1.61	28.5
Feb. 18	.....do.....	2.52	335				

[a] Measurement made by wading.

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Daily discharge, in second-feet, of Owasco outlet near Auburn, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	207	608	194	1,600	203	a168	149	132	109	.....	52.9	105
2	218	a 534	a 196	1,470	204	174	129	119	117	.....	a 55.2	83.4
3	320	469	230	1,300	234	171	132	a 36.6	91.5	76.6	80.8	95.2
4	367	424	203	1,220	a 117	175	98	130	92.8	56.6	63.8	83.9
5	a 388	391	210	1,170	209	171	133	115	87.4	a 56.0	76.7	90.8
6	471	386	197	a1,110	198	181	a 69.4	121	71.1	90.1	66.8	78.2
7	569	306	214	1,030	154	165	127	114	a 86.3	79.6	70.2	a 83.3
8	606	231	234	924	169	a152	135	112	106	71.6	46.8	84.6
9	675	a 207	a 216	820	172	171	131	87.1	91.9	73.3	a 99.9	92
10	741	200	227	810	176	163	134	a 26.5	87.7	67.7	80.5	95
11	754	207	234	803	a 151	174	124	108	91.7	64.7	67.1	98
12	a 830	247	249	813	175	161	97.7	95.8	84.1	a 47.3	66.3	100
13	905	289	243	a 763	165	154	a 62.1	104	86	99.1	77.3	102
14	915	244	278	716	160	177	128	114	86	74.4	76.0	106
15	844	213	377	648	161	a 59.8	124	103	86	74.4	56.0	110
16	799	a 166	a 464	598	150	135	126	81.1	85	70.6	a 70.0	115
17	853	200	502	545	155	128	123	a 28.4	85	67.3	122	117
18	931	189	472	522	a 147	119	139	103	84	56.7	80.9	109
19	a 955	183	452	504	156	129	143	103	83	a 53.3	94.9	90.2
20	1,010	187	440	a 460	158	126	a 94.5	91.3	83	113	93.4	74.8
21	961	178	430	413	157	109	147	97.6	83	83.5	90.7	a 117
22	932	180	425	351	170	a 18.7	135	96.9	82	70	71.2	144
23	948	a 169	a 410	332	156	112	148	81.8	82	70	a 76.2	112
24	881	204	410	265	153	126	131	a 24.0	82	69.4	103	110
25	858	183	410	276	a 107	132	124	101	81	60.2	83.8	110
26	a 821	196	1,000	326	170	133	125	94.7	81	a 90.2	89.8	117
27	765	194	2,000	a 187	164	130	a 69.1	90.4	80	99.5	67.4	130
28	708	197	2,700	256	139	94.2	132	90.1	80	77.3	105	133
29	681	.....	2,750	207	156	a 19.6	123	128	80	72.6	78.5	134
30	654	.....	a2,300	205	113	132	137	79.7	79	74.2	a 78.0	134
31	643	.....	1,800	.....	175	.....	114	a 78.8	79	70.9	.....	135

a Suhday.

NOTE.—Discharge Mar. 20–31, Sept. 13 to Oct. 2, Dec. 9–14, and 25–31, inclusive, estimated from Owasco Lake records. See "Accuracy" in station description.

Monthly discharge of Owasco outlet near Auburn, N. Y., for 1913.

[Drainage area, 206 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	1,010	207	716	3.48	4.01	A.
February	608	a 166	264	1.28	1.33	A.
March	2,750	194	660	3.20	3.69	B.
April	1,600	a 187	688	3.34	3.73	A.
May	234	a 107	164	.796	.92	A.
June	181	a 18.7	135	.655	.74	A.
July	149	a 62.1	122	.592	.68	A.
August	132	a 26.5	93.5	.454	.52	A.
September	117	71.1	89.5	.434	.48	C.
October	113	a 47.3	73.8	.358	.41	A.
November	122	46.8	78.4	.381	.43	A.
December	144	74.8	106	.515	.59	B.
The year	2,750	a 18.7	266	1.29	17.53	

a Sunday.

NOTE.—Figures indicate the flow as controlled by dam at outlet of Owasco Lake. See footnote to table of daily discharge.

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ONEIDA RIVER AT CAUGHDENOY, N. Y.

Location.—At Caughdenoy, about 6 miles above the old Euclid station at Oak Orchard State dam, half a mile below the mouth of Caughdenoy Creek, and 5 miles below Lake Oneida.

Records available.—August 30, 1902, to December 31, 1909 (at Euclid); January 1, 1910, to December 31, 1913 (at Caughdenoy station). Data published also in annual reports of New York State engineer and surveyor.

Drainage area.—1,377 square miles.

Gage.—Staff on right-hand side of stream, about 150 feet upstream from dam.

Discharge measurements.—Discharge measured over a masonry dam 415 feet long, completed at Caughdenoy during the summer of 1909. Crest of dam practically level at elevation 369.4 feet; ogee in cross section; upstream part of crest with slope or batter of 1 foot rise in 2 feet horizontal width; downstream part of crest rounded, with radius of 3.24 feet. Discharge over the dam computed from formulas derived from experiments made by engineers of the United States Geological Survey on a dam of ogee cross section similar in form; correction made for velocity of approach.

Diversions.—In the summer and to some extent in the winter water is diverted past left-hand end of dam through Caughdenoy lock. Estimate of amount so diverted is included in calculated discharge of the river.

Mean daily discharge, in second-feet, of Oneida River at Caughdenoy, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Oct.	Nov.	Dec.
1	2,737	5,696	2,922	7,979	3,891	2,072	1,019	172	.....	.....	412
2	3,106	5,322	2,922	8,583	3,891	2,122	926	151	.....	.....	283
3	3,258	5,322	3,106	8,836	3,570	2,122	926	259	.....	.....	172
4	2,600	4,958	2,922	8,583	3,411	2,072	1,019	172	.....	.....	172
5	3,258	4,584	2,737	7,979	3,411	2,021	926	222	.....	.....	82
6	3,570	4,584	2,600	8,281	3,258	2,021	283	172	.....	.....	82
7	4,222	4,222	2,330	7,979	2,922	1,703	412	172	.....	.....	412
8	4,584	4,222	2,072	7,979	2,600	1,703	746	151	.....	.....	172
9	5,322	3,891	2,198	7,979	2,463	1,648	832	172	.....	.....	570
10	5,322	3,891	2,330	8,281	2,198	1,648	1,703	151	.....	.....	746
11	5,696	3,570	2,330	8,583	2,147	1,512	659	151	.....	.....	746
12	5,322	3,570	2,600	7,700	2,198	1,566	659	172	.....	.....	570
13	5,696	3,891	3,106	7,400	2,072	1,703	832	121	.....	82	570
14	5,696	3,570	3,258	7,064	2,072	1,430	412	121	.....	82	570
15	5,322	3,258	3,891	7,638	2,021	1,367	385	43	.....	172	412
16	4,958	3,258	4,958	6,496	1,945	1,430	385	43	.....	172	412
17	5,696	3,570	5,322	6,496	2,021	1,219	385	30	.....	283	412
18	6,082	3,258	6,082	6,082	1,824	1,324	344	22	.....	172	283
19	6,496	3,258	5,322	4,958	1,324	1,430	344	.....	.....	283	412
20	6,738	2,922	5,322	5,322	1,566	1,219	385	82	.....	283	412
21	6,738	2,737	5,696	4,958	1,566	1,261	385	22	.....	412	412
22	7,064	2,922	6,082	5,322	1,566	1,119	344	82	.....	412	283
23	7,400	2,922	5,696	4,958	1,824	1,119	412	.....	.....	283	926
24	7,064	3,106	6,082	4,958	1,703	1,119	344	22	.....	570	283
25	6,738	2,922	6,496	4,584	1,703	1,219	344	22	.....	412	412
26	6,496	3,106	6,738	4,584	1,824	1,119	385	82	.....	412	570
27	6,082	2,922	7,979	4,389	2,198	1,079	307	22	82	570	1,324
28	6,738	2,737	8,836	4,222	2,072	1,019	222	.....	172	926	926
29	7,064	.....	9,640	3,891	2,198	1,159	172	.....	22	412	746
30	6,738	.....	10,721	3,570	2,072	1,019	222	22	.....	570	412
31	6,082	.....	9,923	.....	2,072	.....	344	.....	.....	.....	283

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Monthly discharge of Oneida River at Caughdenoy, N. Y., for 1913.

[Drainage area, 1,377 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
January	7,400	2,600	5,480	3.98	4.59
February	5,696	2,737	3,721	2.70	2.81
March	10,721	2,072	4,910	3.57	4.12
April	8,836	3,570	6,491	4.71	5.26
May	3,891	1,324	2,310	1.68	1.94
June	2,072	1,019	1,485	1.08	1.21
July	1,703	172	550	.399	.46
August	259	22	110	.080	.09
September					
October 27–29	172	22			
November	926	82	362	.263	.303
December	1,324	82	467	.339	.391

SALMON RIVER AT STILLWATER BRIDGE, NEAR REDFIELD, N. Y.

Location.—On Stillwater highway bridge, 6¼ miles by road east of Altmar, one-fourth mile above proposed dam of Ontario Power Co., seven-eighths of a mile below Pennock Brook, and 7 miles below mouth of North Branch.

Records available.—June 24, 1911, to December 16, 1913.

Drainage area.—191 square miles.

Gage.—Chain, attached to upstream side of bridge; read daily morning and evening to hundredths. Limits of use: Hundredths below 2.0, half-tenths from 2.0 to 3.5, and tenths above 3.5 feet.

Control.—Small stone and gravel.

Discharge measurements.—Made from the bridge or by wading.

Floods.—Crest of flood of March 25–30, 1913, reached gage height 10.5 feet on the afternoon of March 27, as recorded by the gage observer and later verified from high-water marks by engineers of the Geological Survey. Corresponding discharge approximately 10,000 second-feet, or 52.4 second-feet per square mile of drainage area.

Accuracy.—Conditions good; open-water records considered excellent.

Cooperation.—Gage read by an employee of the Salmon River Power Co., of Niagara Falls, N. Y.

Discharge measurements of Salmon River at Stillwater Bridge, near Redfield, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Feb. 24[a]	C. S. De Golyer	4.54	763	May 9	R. S. Barnes	2.10	180
Mar. 11[b]	R. S. Barnes	3.06	421	29	C. S. De Golyer	4.65	1,490
29	C. C. Covert	5.49	2,320	30	....do	3.58	785
Apr. 14	R. S. Barnes	4.85	1,630	Nov. 4	G. H. Canfield	2.57	326
14	....do	4.85	1,660	4	....do	2.70	400

[a] Open water at gage; ice cover at control.

[b] Very slight ice effect.

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Daily gage height, in feet, of Salmon River at Stillwater Bridge, near Redfield, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.8	3.8	.....	6.6	2.7	2.7	1.67	1.52	1.54	1.58	2.8	2.95
2	3.6	3.4	3.0	5.4	2.6	3.2	1.66	1.54	1.52	1.69	2.6	2.85
3	3.9	3.5	3.0	4.5	2.45	2.9	1.65	1.52	1.50	2.3	2.5	3.0
4	5.3	3.6	2.95	6.2	2.35	2.6	1.62	1.54	1.48	2.2	2.7	3.15
5	5.6	3.4	2.9	7.4	2.3	2.45	1.61	1.52	1.48	1.92	2.95	3.6
6	5.4	3.9	2.85	6.0	2.25	2.3	1.60	1.50	1.48	1.82	2.75	3.35
7	7.0	4.2	2.8	5.0	2.2	2.7	1.60	1.48	1.46	1.74	2.55	3.45
8	7.0	4.2	2.75	4.6	2.15	3.2	1.60	1.47	1.46	1.70	2.4	5.4
9	6.4	4.1	2.7	3.7	2.1	2.75	1.62	1.50	1.45	1.68	2.95	4.2
10	5.8	3.8	2.9	3.5	2.1	2.45	2.65	1.60	1.44	1.66	4.7	3.9
11	5.2	3.6	3.2	4.8	2.05	2.3	2.55	1.62	1.43	1.64	3.7	3.35
12	6.2	3.5	3.5	5.9	2.05	2.2	2.15	1.57	1.43	1.84	3.3	3.2
13	5.9	3.3	3.7	5.2	2.05	2.1	2.9	1.52	1.45	2.05	3.0	3.2
14	5.1	3.2	5.1	4.8	2.05	2.0	2.4	1.50	1.48	2.01	3.7	3.2
15	4.5	3.2	7.4	4.7	2.05	1.96	2.05	1.47	1.47	1.91	3.6	3.05
16	4.4	3.1	7.5	4.6	2.0	1.93	1.90	1.48	1.46	1.91	3.15	3.1
17	5.6	3.0	5.9	4.3	2.05	1.90	1.84	1.44	1.48	1.87	3.0	3.5
18	8.9	3.0	5.0	3.9	2.15	1.83	1.74	1.44	1.53	1.85	2.8	.....
19	8.9	2.95	4.7	3.7	2.25	1.80	1.71	1.42	1.64	2.2	2.85	.....
20	6.8	2.95	5.7	3.4	2.1	1.88	1.66	1.40	1.60	3.9	6.3	.....
21	8.0	3.1	7.4	3.2	2.05	1.92	1.66	1.38	1.88	5.5	5.4	.....
22	7.0	3.5	8.4	3.1	2.95	1.86	1.62	1.54	3.00	4.5	4.2	.....
23	5.6	4.5	5.8	3.0	4.4	1.84	1.61	1.82	2.86	3.7	3.8	.....
24	6.2	4.6	5.5	3.0	3.6	1.77	1.62	1.81	2.11	3.4	3.8	.....
25	5.3	4.4	8.8	2.9	3.1	1.70	1.74	1.70	1.84	5.3	3.5	.....
26	4.6	4.0	9.2	2.8	2.75	1.68	1.65	1.60	1.75	4.8	3.35	.....
27	4.6	.....	9.7	2.75	2.7	1.79	1.60	1.64	1.58	3.9	3.25	.....
28	4.4	.....	8.4	2.7	4.1	1.86	1.60	1.60	1.64	3.35	3.1	.....
29	4.3	.....	5.8	3.1	4.6	1.76	1.60	1.64	1.61	3.2	3.05	.....
30	3.9	.....	4.8	2.95	3.6	1.71	1.60	1.64	1.58	3.25	3.05	.....
31	3.8	.....	5.3	.....	3.0	.....	1.56	1.58	.....	3.05	.....	.....

NOTE.—Discharge relation affected by ice Feb. 6 to Mar. 1. Old dam which formed control at high water washed out by flood Mar. 26, 1913. Gage readings discontinued Dec. 17 on account of backwater which was caused by construction of new dam and which may slightly affect all gage heights for December.

Daily discharge, in second-feet, of Salmon River at Stillwater Bridge, near Redfield, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	672	672	430	3,520	374	374	90	63	67	74	414	478
2	598	532	410	2,150	336	594	88	67	63	93	336	435
3	712	564	410	1,380	283	456	86	63	60	235	300	500
4	1,515	598	396	3,020	250	336	81	67	57	206	374	570
5	1,780	532	381	4,580	235	283	79	63	57	138	478	806
6	1,600	.....	367	2,780	220	235	77	60	57	118	394	670
7	3,260	.....	353	1,780	206	374	77	57	54	103	318	723
8	3,260	.....	340	1,460	193	594	77	56	54	95	266	1,400
9	2,560	.....	326	862	180	394	81	60	52	91	478	1,000
10	1,960	.....	381	750	180	283	355	77	51	88	1,200	900
11	1,440	.....	469	1,620	168	235	318	81	50	84	862	670
12	2,350	.....	564	2,670	168	206	193	72	50	122	644	594
13	2,050	.....	634	1,960	168	180	456	63	52	168	500	594
14	1,360	.....	1,360	1,620	168	156	266	60	57	158	862	594
15	985	.....	3,780	1,540	168	147	168	56	56	136	806	523
16	935	.....	3,910	1,460	156	141	134	57	54	136	570	546
17	1,780	.....	2,050	1,240	168	134	122	51	57	128	500	.....
18	5,840	.....	1,290	980	193	120	103	51	65	124	414	.....
19	5,840	.....	1,100	862	220	114	97	48	84	206	435	.....
20	3,020	.....	1,870	696	180	130	88	45	77	980	2,000	.....
21	4,580	.....	3,780	594	168	138	88	42	130	1,750	1,750	.....
22	3,260	.....	5,140	546	478	126	81	67	505	1,385	1,170	.....
23	1,780	.....	1,960	500	1,310	122	79	118	439	862	920	.....
24	2,350	763	1,090	500	806	108	81	116	183	696	920	.....
25	1,520	.....	5,700	456	546	95	103	95	122	1,600	750	.....
26	1,040	.....	7,100	414	394	91	86	77	104	1,400	670	.....
27	1,040	.....	7,800	394	374	112	77	84	74	980	619	.....
28	985	.....	5,980	374	1,100	126	77	77	84	670	546	.....
29	885	.....	2,560	546	1,460	106	77	84	79	594	523	.....
30	712	.....	1,620	478	806	97	77	84	74	619	523	.....
31	672	.....	2,050	.....	500	.....	70	74	.....	523	.....	.....

NOTE.—New discharge rating curve used beginning Mar. 26, 1913, on account of old dam being washed out. Discharge for December may be too large on account of backwater from new dam under construction below the station.

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Monthly discharge of Salmon River at Stillwater Bridge, near Redfield, N. Y., for 1913.

[Drainage area, 191 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	5,840	598	2,010	10.5	12.11	B.
February	.....	.....	466	2.44	2.54	D.
March	7,800	326	2,140	11.2	12.91	C.
April	4,580	374	1,390	7.28	8.12	A.
May	1,460	156	392	2.05	2.36	A.
June	594	91	220	1.15	1.28	A.
July	456	70	127	.665	.77	A.
August	118	42	66.9	.351	.42	B.
September	505	50	98.9	.518	.58	A.
October	1,750	74	470	2.46	2.84	A.
November	2,000	266	685	3.59	4.00	B.
December 1-16	1,400	.....	514	2.69	3.10	C.
The year	7,800	42	718	3.76	51.03	

NOTE.—See footnote to table of daily discharge.

SALMON RIVER NEAR PULASKI, N. Y.

Location.—At highway bridge known locally as Fox's bridge, about 2½ miles above the village of Pulaski, 2¼ miles above Trout Brook, and 6½ miles above mouth of river.

Records available.—September 5, 1900, to June 30, 1907; August 16 to December 6, 1908; July 14, 1910, to December 31, 1913. Data published also in reports of New York State engineer and surveyor, New York State Water Supply Commission, and State of New York Conservation Commission.

Drainage area.—260 square miles.

Gage.—Chain gage installed July 23, 1902; vertical staff attached to upstream end of center pier of bridge, read September 5, 1900, to the winter of 1901–1902, when it was destroyed by ice; zero of chain gage 1.20 feet below that of original staff gage. Gage read daily, morning and evening, to half-tenths. Limits of use: Hundredths below 3.0, half-tenths from 3.0 to 4.5, and tenths above 4.5.

Control.—Gravel; fairly permanent.

Discharge measurements.—Made either by wading or from bridge.

Winter flow.—Discharge relation affected by ice.

Floods.—Crest of flood of March 25-30, 1913, reached gage height 8.2 feet during the night of March 27–28, as indicated by records of the gage observer and by determinations from high-water marks by engineers of the Geological Survey. Corresponding discharge approximately 13,300 second-feet, or 51 second-feet per square mile of drainage area.

Accuracy.—Open-water curve well developed. Published data considered good.

Discharge measurements of Salmon River near Pulaski, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 29	C. S. De Golyer	4.38	1,700
Nov. 3[a]	G. H. Canfield	3.10	382

[a] Measurement made by wading.

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Daily gage height, in feet, of Salmon River near Pulaski, N. Y., for 1913.

[Seymour J. Fox, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.9	3.7	.....	5.9	3.25	3.2	2.50	2.35	2.35	2.35	3.3	3.25
2	3.6	3.45	.....	4.8	3.15	3.5	2.50	2.32	2.30	2.48	3.2	3.2
3	3.9	3.5	.....	4.6	3.1	3.35	2.48	2.30	2.30	2.70	3.1	3.3
4	4.5	3.6	.....	5.3	3.0	3.2	2.48	2.32	2.30	2.75	3.1	3.4
5	4.6	3.35	.....	6.2	3.0	3.0	2.45	2.35	2.30	2.65	3.4	3.7
6	4.7	3.3	.....	5.4	2.92	2.95	2.45	2.30	2.28	2.52	3.25	3.5
7	5.7	.....	.....	4.6	2.90	3.0	2.42	2.30	2.25	2.48	3.15	3.45
8	5.6	.....	.....	4.1	2.85	3.65	2.40	2.30	2.30	2.45	3.0	4.5
9	5.0	.....	.....	4.0	2.82	3.3	2.48	2.30	2.23	2.40	3.1	3.9
10	4.6	.....	.....	3.85	2.80	3.1	2.85	2.38	2.25	2.40	4.3	3.9
11	4.7	.....	.....	4.5	2.82	2.98	3.15	2.42	2.25	2.38	4.0	3.6
12	5.0	.....	.....	5.3	2.80	2.88	3.0	2.38	2.25	2.45	3.6	3.4
13	4.8	.....	.....	4.9	2.80	2.80	3.2	2.35	2.25	2.70	3.4	3.5
14	4.5	.....	5.8	4.6	2.80	2.80	3.0	2.30	2.25	2.60	3.8	3.45
15	4.2	.....	6.5	4.6	2.80	2.70	2.95	2.30	2.25	2.60	3.9	3.45
16	4.15	.....	6.5	4.4	2.80	2.70	2.62	2.30	2.25	2.60	3.55	3.45
17	4.8	.....	5.3	4.25	2.80	2.68	2.58	2.30	2.28	2.60	3.35	3.4
18	6.6	.....	4.8	4.0	2.80	2.60	2.52	2.30	2.32	2.58	3.3	3.4
19	6.5	.....	4.9	3.9	2.95	2.60	2.50	2.25	2.42	2.60	3.25	3.2
20	5.6	.....	5.0	3.85	2.85	2.62	2.45	2.25	2.38	3.7	5.0	3.2
21	6.2	.....	6.3	3.65	2.80	2.65	2.48	2.25	2.48	4.9	5.0	3.25
22	5.6	.....	7.0	3.5	3.3	2.65	2.40	2.30	3.25	4.6	4.2	3.2
23	5.4	.....	5.4	3.5	4.4	2.58	2.40	2.50	3.0	3.9	3.8	3.1
24	5.2	.....	5.5	3.4	3.85	2.50	2.40	2.52	2.75	3.9	3.8	3.3
25	4.7	.....	6.8	3.4	3.65	2.55	2.50	2.48	2.68	4.8	3.7	3.25
26	4.4	.....	7.3	3.3	3.3	2.48	2.48	2.40	2.50	4.6	3.5	3.25
27	4.3	.....	7.4	3.3	3.2	2.62	2.40	2.40	2.50	4.2	3.5	2.95
28	4.0	.....	7.0	3.25	3.9	2.62	2.40	2.40	.....	3.7	3.4	2.92
29	3.7	.....	5.5	3.45	4.5	2.60	2.38	2.40	2.35	3.6	3.3	3.0
30	3.8	.....	4.8	3.4	3.8	2.52	2.38	2.42	2.38	3.6	3.3	3.05
31	3.8	.....	5.0	.....	3.5	.....	2.35	2.40	.....	3.45	.....	3.0

NOTE.—Discharge relation affected by ice Feb. 7 to Mar. 13.

Daily discharge, in second-feet, of Salmon River near Pulaski, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,020	845	.....	4,250	500	465	118	79	79	79	535	500
2	760	642	.....	2,090	432	680	118	72	68	112	465	465
3	1,020	680	.....	1,800	400	570	112	68	68	191	400	535
4	1,680	760	.....	2,940	340	465	112	72	68	213	400	605
5	1,800	570	.....	5,080	340	340	104	79	68	172	605	845
6	1,940	535	.....	3,140	296	312	104	68	65	125	500	680
7	3,770	.....	.....	1,800	285	340	96	68	60	112	432	642
8	3,550	.....	.....	1,220	260	802	90	68	68	104	340	1,680
9	2,400	.....	.....	1,120	245	535	112	68	60	90	400	1,020
10	1,800	.....	.....	978	235	400	260	86	60	90	1,440	1,020
11	1,940	.....	.....	1,680	245	329	432	96	60	86	1,120	760
12	2,400	.....	.....	2,940	235	275	340	86	60	104	760	605
13	2,090	.....	.....	2,240	235	235	465	79	60	191	605	680
14	1,680	.....	4,000	1,800	235	235	340	68	60	152	930	642
15	1,330	.....	6,000	1,800	235	191	312	68	60	152	1,020	642
16	1,280	.....	6,000	1,560	235	191	160	68	60	152	720	642
17	2,090	.....	2,940	1,380	235	183	145	68	65	152	570	605
18	6,330	.....	2,090	1,120	235	152	125	68	72	145	535	605
19	6,000	.....	2,240	1,020	312	152	118	60	96	152	500	465
20	3,550	.....	2,400	978	260	160	104	60	86	845	2,400	465
21	5,080	.....	5,370	802	235	172	112	60	112	2,240	2,400	500
22	3,550	.....	7,750	680	535	172	90	68	500	1,800	1,330	465
23	3,140	.....	3,140	680	1,560	145	90	118	340	1,020	930	400
24	2,750	.....	3,340	605	978	118	90	125	213	1,020	930	535
25	1,940	.....	7,020	605	802	135	118	112	183	2,090	845	500
26	1,560	.....	8,880	535	535	112	112	90	118	1,800	680	500
27	1,440	.....	9,270	535	465	160	90	90	118	1,330	680	312
28	1,120	.....	7,750	500	1,020	160	90	90	98	845	605	296
29	845	.....	3,340	642	1,680	152	86	90	79	760	535	340
30	930	.....	2,090	605	930	125	86	96	86	760	535	370
31	930	.....	2,400	.....	680	.....	79	90	.....	642	.....	340

NOTE.—Discharge computed from a well-defined rating curve.

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Monthly discharge of Salmon River near Pulaski, N. Y., for 1913.

[Drainage area, 260 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	6,330	760	2,310	8.88	10.24	B.
February	.....	.....	530	2.04	2.12	D.
March	9,270	.....	2,980	11.5	13.26	B.
April	5,080	500	1,570	6.04	6.74	B.
May	1,680	235	491	1.89	2.18	B.
June	802	112	282	1.08	1.20	B.
July	465	79	155	.596	.69	B.
August	125	60	80	.308	.36	B.
September	500	60	106	.408	.46	B.
October	2,240	79	572	2.20	2.54	B.
November	2,400	340	805	3.10	3.46	B.
December	1,680	296	602	2.32	2.68	B.
The year	9,270	60	879	3.38	45.93	

NOTE.—Discharge Feb. 7 to Mar. 13, inclusive, estimated by comparison with records of Black River near Boonville.

ORWELL BROOK NEAR ALTMAR, N. Y.

Location.—At highway bridge 1½ miles by road northwest of Altmar and one-eighth mile above confluence of Orwell Brook with Salmon River.

Records available.—June 23, 1911, to December 31, 1913.

Drainage area.—22.1 square miles.

Gage.—Standard chain attached to downstream side of bridge; read daily, morning and evening, to quarter-tenths. Limits of use: Hundredths below 3.0, half-tenths from 3.0 to 4.0, and tenths above 4.0 feet.

Control.—Composed of small stone and gravel.

Discharge measurements.—Made by wading at low stages; from bridge at high stages.

Winter flow.—Discharge relation probably affected by ice.

Floods.—Maximum gage height recorded by observer during high water of March 25–30, 1913, 4.8 feet on morning of March 27. Corresponding discharge, about 460 second-feet, or 21 second-feet per square mile of drainage area. Determinations made later from high-water marks by engineers of the Geological Survey indicate that crest of flood may have exceeded stage recorded by observer.

Accuracy.—Discharge rating curve well defined; estimates good.

The following discharge measurement was made by C. S. De Golyer by wading at a section 300 feet above the gage:

May 30, 1913: Gage height, 2.42 feet; discharge, 47.3 second-feet.

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Daily gage height, in feet, of Orwell Brook near Altmar, N. Y., for 1913.

[Mrs. A. G. White, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.60	2.65	2.40	3.0	2.20	2.15	1.85	1.75	1.70	1.80	2.35	2.25
2	2.35	2.75	2.25	2.92	2.20	2.36	1.85	1.75	1.70	1.82	2.25	2.28
3	3.2	2.78	2.78	2.78	2.15	2.28	1.84	1.75	1.70	1.85	2.20	2.30
4	3.35	2.72	2.62	3.2	2.15	2.20	1.82	1.75	1.70	1.79	2.25	2.35
5	3.05	2.62	2.45	3.05	2.15	2.12	1.80	1.75	1.70	1.78	2.25	2.35
6	3.15	3.0	2.45	2.92	2.12	2.08	1.80	1.74	1.70	1.75	2.20	2.30
7	3.75	.....	2.52	2.78	2.10	2.50	1.79	1.72	1.70	1.75	2.15	2.40
8	3.7	.....	2.62	2.68	2.05	2.35	1.79	1.75	1.69	1.75	2.10	2.82
9	3.5	.....	2.85	2.62	2.05	2.18	1.80	1.75	1.68	1.75	2.38	2.72
10	3.35	.....	2.92	2.50	2.05	2.08	1.98	1.80	1.68	1.75	2.58	2.48
11	3.3	.....	2.82	3.05	2.05	2.05	1.88	1.76	1.70	1.75	2.42	2.42
12	3.2	.....	2.78	2.95	2.05	2.02	1.88	1.75	1.70	1.95	2.35	2.58
13	3.1	.....	2.88	2.72	2.02	2.00	2.05	1.72	1.70	1.95	2.32	2.38
14	3.05	.....	4.7	2.60	2.02	1.98	1.91	1.71	1.70	1.90	2.45	2.35
15	2.81	.....	4.8	2.48	2.02	1.95	1.85	1.70	1.70	1.85	2.35	2.35
16	2.85	3.8	4.0	2.40	2.02	1.95	1.84	1.70	1.70	1.85	2.34	2.35
17	4.0	3.75	4.0	2.38	2.02	1.94	1.82	1.70	1.75	1.85	2.25	2.44
18	4.3	3.7	4.0	2.40	2.11	1.90	1.81	1.70	1.75	1.90	2.22	2.42
19	4.0	3.7	3.15	2.40	2.10	1.90	1.80	1.70	1.70	2.00	2.30	2.41
20	3.5	3.7	3.4	2.35	2.05	1.95	1.78	1.70	1.70	3.0	2.95	2.35
21	3.9	3.2	4.0	2.35	2.05	1.95	1.78	1.70	1.78	3.1	2.68	2.35
22	3.4	2.80	3.6	2.68	2.72	1.94	1.75	1.78	2.16	2.75	2.55	2.32
23	3.05	2.70	3.1	3.0	2.55	1.90	1.75	1.80	1.88	2.55	2.50	2.40
24	3.4	2.80	3.25	3.0	2.40	1.86	1.80	1.75	1.80	2.95	2.45	2.40
25	3.1	3.1	4.2	2.25	2.40	1.85	1.80	1.70	1.80	2.90	2.40	2.40
26	2.88	3.0	4.6	2.25	2.40	1.95	1.79	1.70	1.80	2.92	2.35	2.35
27	2.98	2.70	4.8	2.30	2.75	1.99	1.76	1.70	1.78	2.64	2.30	2.70
28	2.78	2.45	3.8	2.62	2.70	1.94	1.75	1.70	1.78	2.55	2.25	2.52
29	2.62	.....	3.2	3.5	2.58	1.86	1.75	1.80	1.78	2.40	2.25	2.45
30	2.50	.....	3.0	2.25	2.36	1.85	1.75	1.75	1.75	2.40	2.25	2.45
31	2.60	.....	3.1	.....	2.22	.....	1.75	1.70	.....	2.40	.....	2.40

NOTE.—Discharge relation affected by ice about Feb. 6-28.

Daily discharge, in second-feet, of Orwell Brook near Altmar, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	66	72	47	119	30	26	11	8	6	9	42	34
2	42	84	34	108	30	43	11	8	6	10	34	36
3	149	88	88	88	26	36	11	8	6	11	30	38
4	173	81	68	149	26	30	10	8	6	9	34	42
5	126	68	52	126	26	24	9	8	6	8	34	42
6	142	.....	52	108	24	22	9	7	6	8	30	38
7	241	.....	58	88	23	56	9	7	6	8	26	47
8	232	.....	68	76	20	42	9	8	6	8	23	94
9	198	.....	98	68	20	29	9	8	6	8	45	81
10	173	.....	108	56	20	22	16	9	6	8	64	54
11	165	.....	94	126	20	20	12	8	6	8	49	49
12	149	.....	88	112	20	18	12	8	6	15	42	64
13	134	.....	102	81	18	17	20	7	6	15	40	45
14	126	.....	431	66	18	16	13	6	6	13	52	42
15	92	.....	453	54	18	15	11	6	6	11	42	42
16	98	.....	288	47	18	15	11	6	6	11	42	42
17	288	.....	288	45	18	15	10	6	8	11	34	51
18	347	.....	288	47	24	13	9	6	8	13	32	49
19	288	.....	142	47	23	13	9	6	6	17	38	48
20	198	.....	181	42	20	15	8	6	6	119	112	42
21	269	.....	288	42	20	15	8	6	8	134	76	42
22	181	.....	215	76	81	15	8	8	27	84	61	40
23	126	.....	134	119	61	13	8	9	12	61	56	47
24	181	.....	167	119	47	11	9	8	9	112	52	47
25	134	.....	327	34	47	11	9	6	9	105	47	47
26	102	.....	410	34	47	15	9	6	9	108	42	42
27	116	.....	453	38	84	17	8	6	8	71	38	78
28	88	.....	250	68	78	15	8	6	8	61	34	58
29	68	.....	149	198	64	11	8	9	8	47	34	52
30	56	.....	119	34	43	11	8	8	8	47	34	52
31	66	.....	134	.....	32	.....	8	6	.....	47	.....	47

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Monthly discharge of Orwell Brook near Altmar, N. Y., for 1913.

[Drainage area, 22.1 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	347	42	155	7.01	8.08	A.
February	.....	.....	40.0	1.81	1.88	D.
March	453	34	183	8.28	9.55	A.
April	198	34	80.5	3.64	4.06	A.
May	84	18	33.7	1.53	1.75	A.
June	56	11	20.7	.937	1.05	B.
July	20	8	10.0	.452	.52	C.
August	9	6	7.16	.324	.37	C.
September	27	6	7.67	.347	.39	C.
October	134	8	38.6	1.75	2.02	B.
November	112	23	44.0	1.99	2.22	A.
December	94	34	49.4	2.24	2.58	A.
The year	453	6	56.1	2.54	34.47	

NOTE.—Discharge Feb. 6–28, inclusive, estimated by comparison with records of Salmon River near Pulaski.

BLACK RIVER NEAR BOONVILLE, N. Y.

Location.—At highway bridge about 2 or 3 miles northeast of Boonville, an equal distance by river downstream from Hawkinsville, and about 1 mile above the mouth of Sugar River, a small tributary from the left.

Records available.—February 16, 1911, to December 31, 1913. Data also published in annual reports of State of New York Conservation Commission and New York State engineer and surveyor.

Drainage area.—303 square miles (measured on United States Geological Survey topographic sheets).

Gage.—Standard chain fastened to the downstream side of the bridge; read daily, morning and evening, to hundredths. Limits of use: Hundredths below 4.0, half-tenths from 4.0 to 5.5, and tenths above 5.5 feet. A staff gage, reading from 6 to 13 feet, fastened to the downstream right-hand abutment, is used for high-water readings.

Control.—Rough and bowldery; permanent.

Discharge measurements.—At high stages made from cable stretched across stream about half a mile above gage; at low stages made by wading at a section near cable.

Winter flow.—Discharge relation affected by ice.

Diversions.—Part of the flow of Black River is diverted past the gaging station through a feeder taking water at the State dam at Forestport and delivering it to the summit level of Black River canal at Boonville. Part of flow passes northward, supplying Black River canal from Boonville to head of slack-water navigation at foot of Lyon Falls; remainder is diverted from drainage basin and flows into Erie canal at Rome. To determine the amount diverted past the station and out of the drainage basin measurements are made in the Forestport feeder at a farm bridge near Speny Hill, 1 mile northeast of Boonville. Measurements of northward flow in the Black River canal are made at a farm bridge half a mile north of Boonville; measurements of the southward flow at a farm bridge about three-fourths mile southeast of Boonville. The results of these measurements are published in tables that follow. The Forestport feeder was opened for service on May 13, 1913, for the purpose of feeding Erie canal, but the Black River canal did not open until later. When navigation is closed on Erie canal the feeder gates are closed also and the surplus water runs over the dam into Black River. Some water leaks through feeder gates and flows through the feeder into Lansing Kill and Mohawk River. Feeder gates were closed November 30, 1913.

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Storage.—A reservoir built by the State at Forest Brook, about 8 miles upstream, stores about 2,000,000,000 cubic feet. About a mile above the station is a site at which a dam 110 feet high would impound 3,300,000,000 cubic feet of water.

Floods.—Crest of flood of March 25–30, 1913, reached gage height about 12.5 feet during the night of March 27–28, as indicated by records of the gage observer and elevation of high-water mark determined by engineers of the Geological Survey. Corresponding discharge, approximately 10,000 second-feet, or 33 second-feet per square mile of drainage area.

Accuracy.—Discharge rating curve well defined. Records do not represent total run-off from drainage area. See "Diversions."

Discharge measurements of Black River near Boonville, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 12	R. S. Barnes	5.44	536	July 29[a]	W. S. Easterly	3.47	70.5
13	do	5.65	622	Aug. 5[a]	do	3.21	40.6
Apr. 15	do	6.10	999	19[a]	do	3.11	33.0

[a] Measurement made by wading.

Discharge measurements of Forestport feeder at Boonville, N. Y., in 1913.

Date.	Hydrographer.	Gage height.[a]	Discharge.	Date.	Hydrographer.	Gage height.[a]	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 9	G. J. Lyon	0.60	289	Aug. 6	W. S. Easterly	0.92	244
July 24	W. S. Easterly	.95	259	7	do	.94	258
25	do	1.18	223	8	do	.97	241
26	do	1.16	252	9	do	1.03	234
28	do	.98	266	10	do	.96	244
29	do	1.06	246	17	do	1.14	247
30	do	1.04	255	18	do	1.05	232
31	do	1.05	242	19	do	.95	239
Aug. 1	do	1.04	251	Sept. 1	C. S. De Golyer	1.06	222
2	do	1.02	244	Oct. 2	W. S. Easterly	.88	262
4	do	1.02	245	28	G. H. Canfield	1.05	262
5	do	.98	246				

[a] Distance from reference point down to water surface.

Discharge measurements of Black River canal (flowing south) at Boonville, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 9	G. J. Lyon	1.09	204	Aug. 6	W. S. Easterly	1.16	194
July 24	W. S. Easterly	1.26	194	7	do	1.26	198
25	do	1.17	182	8	do	1.28	187
26	do	1.43	187	9	do	1.35	191
28	do	1.21	185	10	do	1.30	192
29	do	1.22	194	17	do	1.60	159
30	do	1.22	193	18	do	1.35	168
Aug. 1	do	1.24	198	19	do	1.25	177
2	do	1.26	192	Sept. 1	C. S. De Golyer	1.40	160
4	do	1.26	188	Oct. 2	W. S. Easterly	1.20	200
5	do	1.20	187	28	G. H. Canfield	1.17	222

Discharge measurements of Black River canal (flowing north) at Boonville, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 11	G. J. Lyon	4.23	59	Aug. 7	W. S. Easterly	6.00	11.8
July 24	W. S. Easterly	4.75	42.1	8	do	4.75	29.6
25	do	4.70	38.4	9	do	4.84	25.0
26	do	4.77	33.8	10	do	4.86	24.8
28	do	4.62	39.8	17	do	4.44	46.8
30	do	4.58	38.6	18	do	4.65	39.0
Aug. 1	do	4.90	29.9	Sept. 1	C. S. De Golyer	4.60	39.5
2	do	4.82	27.6	Oct. 2	W. S. Easterly	4.25	50.6
4	do	4.78	26.9	28	G. H. Canfield	1.94	14.8
6	do	4.82	25.1				

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Daily gage height, in feet, of Black River near Boonville, N. Y., for 1913

[W. D. Charboneau, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.7	5.9	5.6	7.6	5.1	7.6	4.1	3.16	3.18	3.18	3.95	4.9
2	5.45	5.7	5.5	7.4	5.3	7.6	3.80	3.22	3.02	3.34	3.80	5.15
3	6.4	5.8	5.35	7.4	5.3	7.3	3.40	3.22	3.10	3.45	4.3	5.3
4	7.0	5.9	5.2	7.2	5.6	5.7	3.25	3.22	3.20	4.05	3.38	5.5
5	7.2	5.6	5.15	7.6	5.3	4.95	3.05	3.19	3.24	4.2	3.50	5.6
6	7.3	5.5	5.3	8.0	5.4	4.4	3.10	3.23	3.24	3.95	3.32	5.3
7	7.8	5.45	5.25	7.0	5.35	4.05	3.08	3.16	3.12	3.38	3.10	5.2
8	7.9	5.6	5.15	6.8	5.1	4.05	3.22	3.29	3.28	3.26	3.50	5.4
9	7.6	5.3	5.0	6.6	5.0	3.80	3.22	3.18	3.25	3.08	5.2	5.15
10	7.1	5.15	5.15	6.4	4.9	3.60	3.06	3.28	3.08	8.12	8.2	5.1
11	7.0	5.25	5.35	6.6	4.7	3.60	3.30	3.24	3.02	3.23	8.0	5.25
12	7.0	5.5	5.6	6.6	4.75	3.50	3.55	3.18	3.12	3.38	7.6	5.4
13	6.6	5.35	5.6	6.7	4.7	3.55	3.45	3.15	3.10	3.24	7.3	5.3
14	6.2	5.45	7.4	6.4	4.4	3.60	3.50	3.16	3.18	3.28	5.9	5.1
15	6.1	5.5	8.2	6.3	4.45	3.48	3.60	3.26	3.12	3.22	5.4	5.05
16	6.3	5.4	8.4	6.2	4.8	3.36	3.38	3.16	3.18	3.22	5.4	4.85
17	6.6	5.6	6.9	6.6	4.8	3.60	3.48	3.22	3.10	3.20	5.05	5.0
18	7.8	5.3	6.6	6.7	4.55	3.70	3.18	3.14	3.19	3.13	4.95	5.0
19	8.4	5.35	6.6	6.1	4.8	3.85	3.30	3.12	3.12	3.12	4.9	4.6
20	8.4	5.2	6.6	6.2	4.7	4.05	3.09	3.08	3.24	4.15	5.8	4.75
21	8.8	5.3	6.7	6.1	4.75	4.7	3.14	3.11	3.38	5.6	6.4	4.6
22	8.4	5.4	7.4	6.0	4.9	4.9	3.25	3.15	3.55	6.3	6.0	4.65
23	7.8	5.3	7.6	6.0	6.2	4.85	3.38	3.28	3.90	5.4	5.8	4.4
24	7.5	5.25	7.7	5.8	5.8	4.7	3.32	3.20	3.75	5.35	5.8	4.6
25	7.1	5.3	8.4	6.0	5.8	4.4	3.22	3.18	3.40	5.25	5.7	4.7
26	6.8	5.6	10.6	6.0	5.6	4.6	3.20	3.14	3.60	5.1	5.3	4.8
27	6.4	5.6	10.6	5.7	5.7	4.65	3.15	3.22	3.60	4.85	5.05	4.55
28	6.1	5.4	10.8	5.7	6.4	4.6	3.20	3.22	3.29	4.8	4.8	4.7
29	5.9	.....	9.1	5.4	7.3	4.5	3.44	3.22	3.02	4.75	5.0	4.7
30	5.9	.....	7.8	5.4	7.7	4.4	3.28	3.16	3.12	4.9	4.8	4.6
31	6.0	.....	7.6	.....	7.6	.....	3.18	3.18	.....	4.7	.....	4.8

NOTE.—Discharge relation probably not materially affected by ice during the early part of the year, but affected by ice about Dec. 27–31.

Daily discharge, in second-feet, of Black River near Boonville, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	735	855	680	2,380	450	2,380	164	39	40	40	136	370
2	605	735	630	2,160	535	2,380	111	44	28	55	111	470
3	1,210	795	558	2,160	535	2,050	61	44	34	66	205	535
4	1,740	855	490	1,940	680	735	46	44	42	154	59	630
5	1,940	680	470	2,380	535	390	30	41	46	184	72	680
6	2,050	630	535	2,860	580	227	34	45	46	136	53	535
7	2,620	605	512	1,740	558	154	33	39	36	59	34	535
8	2,740	680	470	1,540	450	154	44	50	49	47	72	580
9	2,380	535	410	1,370	410	111	44	40	46	33	490	470
10	1,840	470	470	1,210	370	84	31	49	33	36	3,110	450
11	1,740	512	558	1,370	305	84	51	46	28	45	2,860	512
12	1,740	630	680	1,370	320	72	78	40	36	59	2,380	580
13	1,370	558	680	1,460	305	78	66	38	34	46	2,050	535
14	1,060	605	2,160	1,210	227	84	72	39	40	49	855	450
15	990	630	3,110	1,140	238	70	84	47	36	44	580	430
16	1,140	580	3,360	1,060	335	57	59	39	40	44	580	352
17	1,370	680	1,640	1,370	335	84	70	44	34	42	430	410
18	2,620	535	1,370	1,460	262	97	40	37	41	36	390	410
19	3,360	558	1,370	990	335	119	51	36	36	36	370	275
20	3,360	490	1,370	1,060	305	154	33	33	46	174	795	320
21	3,880	535	1,460	990	320	305	37	35	59	680	1,210	275
22	3,360	580	2,160	920	370	370	46	38	78	1,140	920	290
23	2,620	535	2,380	920	1,060	352	59	49	127	580	795	227
24	2,270	512	2,500	795	795	305	53	42	104	558	795	275
25	1,840	535	3,360	920	795	227	44	40	61	512	735	305
26	1,540	680	6,390	920	680	275	42	37	84	450	535	335
27	1,210	680	6,390	735	735	290	38	44	84	352	430	.....
28	990	580	6,680	735	1,210	275	42	44	50	335	335	.....
29	855	.....	4,280	580	2,050	250	65	44	28	320	410	.....
30	855	.....	2,620	580	2,500	227	49	39	36	370	335	.....
31	920	.....	2,380	.....	2,380	.....	40	40	.....	305	.....	.....

NOTE.—Open-water rating curve used Jan. 1 to Dec. 26. Discharge from about Feb. 8 to Mar. 8 may be slightly large for this reason.

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Monthly discharge of Black River near Boonville, N. Y., for 1913.

[Drainage area, 303 square miles.]

Month.	Discharge in second-feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
January	3,980	605	1,840	A
February	955	470	616	C
March	6,680	410	2,000	B
April	2,980	580	1,340	A
May	2,500	227	676	A
June	2,380	57	415	A
July	164	30	55.4	B
August	50	33	41.5	B
September	127	28	49.4	B
October	1,140	33	225	B
November	3,110	34	738	A
December	680	227	403	A
The year	6,680	28	702	

NOTE.—Estimates do not indicate natural flow, as stream is regulated at Forestport reservoir and certain amounts of water are diverted out of the drainage area and around the station. See "Diversions" and "Storage" in station description.

BLACK RIVER AT FELTS MILLS, N. Y.

Location.—At dam of Lefevre Paper Co., formerly owned by Black River Traction Co., about 1½ miles above village of Felts Mills. Dam is 9 miles upstream from Watertown and 7 miles upstream from the old gaging station at Huntingtonville.

Records available.—February, 1897, to December, 1901, at Huntingtonville dam; August 29, 1902, to December 31, 1913, at Felts Mills. Data also in annual reports of the State of New York engineer and surveyor.

Drainage area.—1,851 square miles.

Gage.—Vertical staff attached to crib at left-hand side of stream above mill; gage readings corrected for velocity of approach during high water.

Determination of discharge.—Previous to August 16, 1910, records were kept of the flow over a dam about 100 feet upstream from the paper mill; dam was of sawed timber resting on a limestone foundation and its main crest was 380.6 feet long. New concrete dam was constructed in summer of 1910 about 100 feet downstream. Main crest of dam for low and medium stages, 300.45 feet long, 3.75 feet wide, and about 6 feet high; upstream face vertical; downstream, semi-ogee section. On right-hand side is an additional section of greater elevation, 48.2 feet long; on left-hand side, angling upstream, is a section 139.7 feet long, making total length of dam for high-water discharge approximately 488.4 feet. A wood-pulp mill constructed at the left-hand end of the dam has been in operation since 1907. The mill contains one 45-inch and four 72-inch Smith-McCormick turbines. Discharge over spillways is calculated by means of weir formula, using coefficients derived from experiments by the United States Geological Survey on a dam of similar cross section. Record is kept of hours run and of gate opening of each wheel as well as head under which turbines operate.

Winter flow.—Discharge relation affected by ice.

Regulation.—Power plants and storage above station.

Accuracy.—Results believed to be good for a station of this type.

Cooperation.—Data as published furnished by New York State engineer and surveyor.

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Mean daily discharge, in second-feet, of Black River at Felts Mills, N. Y., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3,306	15,234	3,267	a 2,634	1,399	923	467	537	2,840	2,671
2	a 1,996	13,907	3,187	3,290	1,309	923	923	1,115	a 1,666	2,671
3	2,795	13,695	2,762	3,197	1,309	a 527	923	537	2,431	2,589
4	2,657	14,346	a 2,243	2,754	254	955	923	1,399	1,776	2,509
5	2,840	13,907	2,476	2,589	1,381	955	521	a 1,491	2,509	2,671
6	2,528	a 13,925	1,329	2,431	a 720	955	923	1,719	2,509	2,754
7	2,528	13,695	1,962	2,137	1,320	923	a 208	1,329	2,509	a 3,170
8	2,528	12,635	1,836	a 1,577	1,309	923	537	1,303	2,509	3,480
9	a 2,243	10,719	1,836	2,208	1,320	923	537	923	a 5,488	3,578
10	2,952	9,445	1,776	1,808	1,399	a 527	730	1,320	5,687	3,578
11	3,868	8,446	a 1,666	1,665	1,399	641	730	923	6,315	3,290
12	4,140	8,120	1,808	1,665	1,341	923	730	(a)	6,575	2,431
13	4,828	a 7,303	1,613	1,474	a 1,322	923	665	1,341	6,188	2,671
14	8,042	7,802	1,367	1,474	1,816	923	a 467	1,049	5,647	a 2,429
15	14,346	7,646	1,474	a 1,082	1,816	923	730	1,399	5,048	2,840
16	a 18,590	6,779	1,435	1,341	1,506	923	537	1,116	a 3,060	2,754
17	17,362	5,967	1,517	1,435	955	a 653	665	923	3,578	2,509
18	15,989	5,143	a 1,240	1,320	923	923	730	955	3,290	2,509
19	13,482	4,504	1,776	1,399	923	923	730	a 859	2,926	2,589
20	11,166	a 4,335	1,836	1,341	a 720	923	537	955	4,369	1,836
21	10,454	4,605	1,962	1,435	923	923	a 467	5,444	5,048	a 1,666
22	10,641	3,914	1,776	a 1,160	923	923	537	5,811	5,166	2,208
23	a 14,640	3,830	1,776	1,517	923	923	553	6,061	a 4,839	2,137
24	14,346	3,514	2,975	1,563	934	a 467	896	5,244	4,932	1,719
25	14,786	3,348	a 2,634	1,435	1,204	955	1,116	4,969	4,261	1,322
26	17,362	3,107	3,157	1,517	923	923	923	a 4,095	3,538	2,280
27	27,260	a 2,831	2,714	1,309	a 254	923	923	4,301	3,065	1,653
28	32,166	3,107	2,631	1,341	1,013	923	a 720	4,231	3,105	a 1,666
29	31,176	3,107	4,193	a 788	923	923	923	4,231	2,896	1,876
30	a 24,373	3,267	4,857	1,309	923	923	923	3,422	a 1,848	1,563
31	16,933	.....	4,857	.....	923	a 527	.....	3,197	.....	1,816

a Sunday.

Monthly discharge of Black River at Felts Mills, N. Y., for 1913.

[Drainage area, 1,851 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
March	32,166	1,996	11,365	6.14	7.08
April	15,234	2,831	7,739	4.18	4.66
May	4,857	1,240	2,323	1.25	1.44
June	3,290	788	1,743	0.942	1.05
July	1,816	254	1,107	0.598	0.689
August	955	467	856	0.462	0.533
September	1,116	208	706	0.381	0.425
October	6,061	537	2,329	1.26	1.44
November	6,575	1,666	3,854	2.08	2.32
December	3,578	1,322	2,433	1.31	1.51

MOOSE RIVER AT MOOSE RIVER, N. Y.

Location.—In the village of Moose River, about 3 miles downstream from McKeever station on Adirondack division of New York Central & Hudson River Railroad, 5 miles below mouth of South Branch of Moose River, and nearly 20 miles above junction of Black and Moose rivers at Lyons Falls.

Records available.—June 5, 1900, to December 31, 1913. Data also in annual reports of the New York State engineer and surveyor and State of New York Conservation Commission.

Drainage area.—370 square miles (measured on United States Geological Survey topographic sheets).

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Gage.—Staff, in two sections, fastened to left bank a short distance above cable; read daily, morning and evening, to half-tenths. Limits of use: Hundredths below 5.5, half-tenths from 5.5 to 6.5, and tenths above 6.5 feet. Gage datum was lowered 0.17 foot February 28, 1903, and again 5.00 feet January 1, 1913.

Control.—Composed of cobble and bowlders; fairly permanent.

Discharge measurements.—Made from a cable a short distance below gage.

Regulation.—Flow regulated for power and log driving by a timber dam at McKeever. During parts of year, therefore, two gage readings a day may not give a representative mean.

Winter flow.—Discharge relation affected by ice.

Floods.—Crest of flood of March 25–30, 1913, reached gage height 16.3 feet on afternoon of March 27, as indicated by gage-height hydrograph and verified by engineers of the Geological Survey. Corresponding discharge, approximately 15,500 second-feet, or 42 second-feet per square mile of drainage area.

Accuracy.—Open-channel rating curve fairly accurate. Discharge data for periods of open water considered good.

Discharge measurements of Moose River at Moose River, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Aug. 15	C. S. De Golyer	a 5.54	153
15	W. S. Easterly	a 5.46	145
Oct. 27	G. H. Canfield	8.37	1,380
27	.....do.....	8.34	1,360

a Measurement made by wading.

Daily gage height, in feet, of Moose River at Moose River, N. Y., for 1913.

[Chris Hannan, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	7.6	6.7	6.8	9.9	6.6	8.0	6.1	5.55	5.18	5.8	6.8	7.2
2	7.8	6.9	6.7	9.7	6.7	8.2	6.0	5.44	5.34	5.95	6.0	7.0
3	8.1	7.0	6.8	9.8	6.6	8.3	6.15	5.55	5.46	6.5	6.7	6.8
4	8.4	7.2	6.6	9.8	6.5	7.8	6.1	5.44	5.41	6.8	6.7	6.4
5	8.2	7.6	6.8	10.4	6.45	7.5	6.2	5.55	5.5	6.3	7.1	6.5
6	8.2	7.5	6.6	10.4	6.35	7.0	5.9	5.65	5.41	6.1	7.0	6.4
7	8.8	7.2	6.8	10.1	6.4	6.7	5.6	5.8	5.12	6.1	6.8	5.9
8	9.8	6.9	6.9	9.5	6.35	6.5	5.55	5.09	5.20	6.0	6.7	6.8
9	9.6	6.9	7.0	8.7	6.4	6.5	5.45	6.15	5.11	5.85	7.2	7.8
10	9.2	6.8	7.3	8.0	6.4	6.45	5.55	5.9	5.20	5.6	11.2	7.2
11	8.7	6.8	7.8	7.9	6.2	6.5	5.85	5.6	5.25	5.5	9.4	6.8
12	8.6	6.7	8.1	7.9	6.25	6.25	6.1	5.6	5.31	5.18	8.4	6.8
13	8.6	6.8	8.6	8.2	6.1	6.25	6.0	5.55	5.29	5.44	8.4	7.0
14	8.6	6.9	9.1	8.2	5.9	6.35	6.1	5.55	5.21	5.8	8.1	6.8
15	8.1	6.9	10.4	8.3	5.7	6.25	5.95	5.42	5.28	6.0	8.2	6.8
16	7.8	7.0	10.7	7.8	5.6	6.2	5.8	5.6	5.30	6.2	8.1	6.5
17	8.6	7.0	10.2	7.7	5.5	6.2	5.95	5.12	5.36	6.1	7.7	6.6
18	9.6	6.8	10.0	7.7	5.4	6.15	5.65	5.6	5.39	6.3	7.5	6.8
19	10.4	6.8	9.8	7.9	5.9	6.1	5.55	5.41	5.65	5.8	7.6	6.6
20	9.8	6.8	9.6	7.7	6.3	6.15	5.44	5.11	5.55	6.6	8.2	6.6
21	10.8	6.8	9.8	7.5	6.5	6.05	4.94	5.30	5.39	8.8	9.2	5.7
22	10.4	6.6	10.0	7.2	6.6	5.95	5.19	5.48	5.55	8.8	8.6	6.1
23	9.9	6.9	10.2	7.2	6.7	6.0	4.94	5.44	5.42	8.1	8.9	5.85
24	9.7	7.2	11.3	7.1	6.9	5.9	5.44	5.06	5.5	7.8	8.3	5.25
25	9.2	7.6	12.2	7.2	7.0	5.7	4.94	5.21	5.6	7.4	8.0	5.29
26	8.8	7.8	14.2	7.2	7.0	5.5	4.94	5.34	5.7	7.7	7.8	5.6
27	8.0	7.3	15.5	7.1	7.1	6.4	4.94	5.6	5.8	8.4	7.8	6.25
28	7.6	7.0	13.8	6.8	8.0	6.5	5.49	5.44	5.6	8.1	8.0	6.05
29	7.2	.....	12.8	6.6	9.3	6.4	5.55	5.31	5.8	7.8	7.7	6.3
30	7.1	.....	11.8	6.5	8.8	6.3	5.65	5.19	5.6	7.5	7.6	6.6
31	6.8	.....	10.2	.....	8.4	.....	5.55	5.14	.....	7.0	.....	6.35

NOTE.—Discharge relation not materially affected by ice during winter of 1912–13.

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Daily discharge, in second-feet, of Moose River at Moose River, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	910	510	545	2,760	476	1,150	316	164	79	229	545	710
2	1,020	585	510	2,570	510	1,280	286	136	112	272	286	625
3	1,220	625	545	2,060	476	1,360	331	164	141	442	510	585
4	1,430	710	476	2,660	442	1,020	316	136	128	545	510	409
5	1,280	910	545	3,280	426	855	346	164	151	377	665	442
6	1,280	855	476	3,280	393	625	257	189	128	316	625	489
7	1,760	710	545	2,980	409	510	176	229	69	316	545	257
8	2,060	585	585	2,280	393	442	164	64	83	286	510	545
9	2,480	585	625	1,670	409	442	138	331	67	243	710	1,020
10	2,120	545	755	1,150	409	426	164	257	83	176	4,230	710
11	1,670	545	1,020	1,090	346	442	248	176	93	151	2,800	545
12	1,590	510	1,220	1,090	362	362	316	176	105	79	1,430	545
13	1,590	545	1,590	1,290	316	362	286	164	101	136	1,430	625
14	1,380	585	2,030	1,290	257	393	316	164	85	229	1,220	545
15	1,220	585	3,280	1,360	202	362	272	131	99	286	1,290	545
16	1,020	625	3,620	1,020	176	346	229	176	103	346	1,220	442
17	1,590	625	3,060	965	151	346	272	69	117	316	965	476
18	2,480	545	2,860	965	126	331	189	176	124	377	855	545
19	3,280	545	2,660	1,090	257	316	164	128	189	229	910	476
20	2,660	545	2,480	965	377	331	136	67	164	476	1,280	476
21	3,740	545	2,660	855	442	301	42	103	124	1,760	2,120	202
22	3,280	476	2,860	710	476	272	81	146	164	1,760	1,590	316
23	2,760	585	3,060	710	510	286	42	136	131	1,220	1,850	243
24	2,570	710	4,360	665	585	257	136	59	151	1,020	1,360	93
25	2,120	910	5,630	710	625	202	42	85	176	805	1,150	101
26	1,760	1,020	9,400	710	625	151	42	112	202	965	1,020	176
27	1,150	755	12,900	665	665	409	42	176	229	1,430	1,020	362
28	910	625	8,800	545	1,150	442	148	136	176	1,220	1,150	301
29	710	.....	6,680	476	2,210	409	164	105	229	1,020	965	377
30	665	.....	5,030	442	1,760	377	189	81	176	855	910	476
31	545	.....	3,060	.....	1,430	.....	164	72	.....	625	.....	393

NOTE.—Discharge throughout year may be determined from open-water rating curve; values somewhat excessive for short period in February.

Monthly discharge of Moose River at Moose River, N. Y., for 1913.

[Drainage area, 370 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	3,740	545	1,780	4.81	5.54	B.
February	1,020	476	639	1.73	1.80	C.
March	12,900	476	3,030	8.19	9.44	B.
April	3,280	442	1,430	3.86	4.31	B.
May	2,210	126	561	1.51	1.74	B.
June	1,360	151	494	1.33	1.47	B.
July	331	42	194	.524	.60	B.
August	331	59	144	.390	.45	B.
September	229	67	134	.362	.40	B.
October	1,760	79	597	1.61	1.86	B.
November	4,230	286	1,170	3.16	3.53	B.
December	1,020	93	449	1.21	1.40	
The year	12,900	42	888	2.40	32.54	

NOTE.—See footnote to table of daily discharge.

MIDDLE BRANCH OF MOOSE RIVER AT OLD FORGE, N. Y.

Location.—About 300 feet below the highway bridge in Old Forge and about 400 feet below the dam.

Records available.—November 9, 1911, to December 31, 1913; published also in annual reports of New York State engineer and surveyor and State of New York Conservation Commission.

Drainage area.—51.5 square miles.

Gage.—Vertical staff, graduated to feet and tenths, reading from 1 foot to 7 feet, spiked to birch tree on left bank of stream 300 feet below highway bridge; read daily, morning and evening, to quarter-tenths. Limits of use: Hundredths below 2.0, until April 17, and below 1.5 after that date, half-tenths from these limits to 3.0, and tenths above 3.0 feet.

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Control.—Rock reef about 200 feet below the gage. Channel fairly straight and uniform from dam to reef. Right bank high and wooded; left bank from highway bridge to within about 50 feet of gage defined by stone wall about 3 feet above ordinary low water.

Discharge measurements.—Made by wading at low and medium stages and from highway bridge at high stages.

Regulation.—Flow controlled at the dam.

Winter flow.—Discharge relation is not affected by ice.

Flood.—Maximum stage of flood of March 25–30, 1913, reached on March 28; computations of discharge through the gates and over the dam at Old Forge indicate mean discharge of 760 second-feet, or 14.8 second-feet per square mile of drainage area.

Accuracy.—Discharge rating curve well defined; estimates good.

Discharge measurements of Middle Branch of Moose River at Old Forge, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Aug. 15	C. S. De Golyer	1.92	60.3	Sept. 24	O. W. Hartwell	1.70	47.9
16	do	1.92	63.0	25	W. S. Easterly	1.48	56.0
Sept. 23	W. S. Easterly	1.92	61.7	25	do	.99	21.6
23	do	1.15	17.6	26	do	1.70	75.5
24	do	1.56	38.5	26	do	2.12	130
24	do	2.32	116	26	do	1.86	93.5
24	do	2.72	187	26	do	2.54	199

NOTE.—All measurements made by wading. Measurements on Sept. 25 and 26 were made after the control had been cleared of logs and brush.

Daily gage height, in feet, of Middle Branch of Moose River at Old Forge, N. Y., for 1913.

[Vernon S. Ervin, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.4	1.99	1.92	4.8	1.85	1.85	1.15	1.95	1.84	1.55	2.22	2.05
2	1.86	1.98	1.92	4.6	1.85	1.85	1.15	1.95	1.85	1.55	2.22	2.05
3	1.35	1.98	1.92	4.3	1.85	1.85	1.15	1.95	1.85	1.55	2.2	1.40
4	1.35	1.98	1.92	4.1	1.85	1.85	1.15	1.95	1.85	1.55	2.2	.75
5	1.35	1.98	1.92	4.1	1.85	1.85	1.15	1.95	1.85	1.55	2.2	.75
6	1.35	1.98	1.98	4.61	1.85	1.85	1.15	1.95	1.85	1.55	2.2	.75
7	1.35	1.95	1.92	4.0	1.85	2.0	1.15	1.95	1.85	1.55	2.32	.75
8	1.00	1.92	1.92	3.4	1.85	2.15	1.15	1.95	1.85	1.55	2.45	.75
9	1.00	1.90	1.92	2.9	1.58	2.0	1.15	1.95	1.85	1.55	2.45	.75
10	1.00	1.90	1.92	2.85	1.3	1.75	1.15	1.95	1.85	1.55	2.45	.75
11	1.00	1.90	1.92	2.95	1.3	1.38	1.15	1.95	1.85	1.90	2.45	.70
12	1.00	1.90	1.92	3.0	1.3	1.10	1.15	1.95	1.85	2.25	2.45	.70
13	1.00	1.90	1.90	3.0	1.3	1.10	1.15	1.95	1.85	2.25	2.45	.70
14	1.00	1.90	1.98	2.9	1.3	1.10	1.15	1.95	1.85	2.25	2.65	.70
15	1.00	1.90	2.2	2.75	1.3	1.10	1.15	1.95	1.88	2.25	2.85	.70
16	1.00	1.90	3.0	2.6	1.3	1.48	1.15	1.95	1.92	2.25	2.8	.70
17	1.00	1.90	3.0	2.35	1.48	1.48	1.15	1.95	1.92	2.25	2.75	.70
18	1.00	1.88	3.2	2.0	1.65	1.10	1.15	1.95	1.92	2.25	2.7	.70
19	1.20	1.88	3.3	1.85	1.75	1.10	1.15	1.95	1.92	2.25	2.7	.70
20	1.40	1.88	3.2	1.85	1.85	1.10	1.15	1.92	1.92	2.25	2.65	.70
21	1.59	1.88	3.2	2.0	1.85	1.10	1.15	1.95	1.92	2.25	2.72	.70
22	1.71	1.89	3.4	2.2	2.2	1.10	1.15	1.95	1.92	2.25	2.7	.70
23	1.78	1.92	3.5	2.3	2.55	1.10	1.15	1.95	1.92	2.25	2.65	.70
24	1.85	1.92	3.6	2.45	2.4	1.10	1.15	1.95	1.92	2.25	2.65	.70
25	1.88	1.92	4.0	2.45	2.15	1.10	1.15	1.96	.....	2.25	2.61	.70
26	1.91	1.92	4.8	2.3	1.92	1.10	1.15	1.95	1.55	2.2	2.6	.70
27	1.95	1.92	5.5	2.0	1.85	1.10	1.55	1.85	1.55	2.25	2.6	.70
28	1.95	1.92	6.3	1.85	2.3	1.75	1.95	1.85	1.55	2.2	2.1	.70
29	1.95	.....	6.2	2.0	2.75	1.78	1.95	1.85	1.55	2.2	2.9	.70
30	1.95	.....	5.5	2.0	2.45	1.15	1.95	1.85	1.55	2.2	2.1	.70
31	1.95	.....	5.0	.....	2.0	.....	1.92	1.82	.....	2.2	.....	.70

NOTE.—Gage heights affected by back water from North Branch of Moose River Mar. 26 to Apr. 7. Gage heights affected by brush lodged on control from Apr. 18 to Sept. 25. Control cleared of all brush and logs Sept. 25.

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Daily discharge, in second-feet, of Middle Branch of Moose River at Old Forge, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	143	83	74	641	58	58	18	67	57	60	142	120
2	68	82	74	617	58	58	18	67	58	60	142	120
3	24	82	74	583	58	58	18	67	58	60	142	46
4	24	82	74	562	58	58	18	67	58	60	142	11
5	24	82	74	549	58	58	18	67	58	60	142	11
6	24	82	82	539	58	58	18	67	58	60	142	11
7	24	78	74	529	58	72	18	67	58	60	158	11
8	10	74	74	328	58	91	18	67	58	60	184	11
9	10	72	74	232	40	72	18	67	58	60	184	11
10	10	72	74	223	25	50	18	67	58	60	184	11
11	10	72	74	242	25	29	18	67	58	90	184	9.0
12	10	72	74	251	25	16	18	67	58	150	184	9.0
13	10	72	72	251	25	16	18	67	58	150	184	9.0
14	10	72	82	232	25	16	18	67	58	150	220	9.0
15	10	72	112	184	25	16	18	67	60	150	262	9.0
16	10	72	251	177	25	34	18	67	64	150	251	9.0
17	10	72	251	135	34	34	18	67	64	150	240	9.0
18	10	70	289	72	44	16	18	67	64	150	230	9.0
19	17	70	308	58	50	16	18	67	64	150	230	9.0
20	27	70	289	58	58	16	18	67	64	150	220	9.0
21	41	70	289	72	58	16	18	67	64	150	230	9.0
22	52	71	328	98	98	16	18	67	64	150	230	9.0
23	59	74	348	113	155	16	18	67	64	150	220	9.0
24	66	74	368	138	129	16	18	67	64	150	220	9.0
25	70	74	451	138	91	16	18	67	62	150	210	9.0
26	73	74	517	113	64	16	18	67	60	142	210	9.0
27	78	74	600	72	58	16	38	58	60	150	210	9.0
28	78	74	760	58	113	50	67	58	60	142	127	9.0
29	78	.....	746	72	194	53	67	58	60	142	274	9.0
30	78	.....	707	72	138	18	67	58	60	142	127	9.0
31	78	.....	665	.....	72	.....	64	56	.....	142	.....	9.0

NOTE.—Discharge determined as follows: Mar. 26 to Apr. 7, inclusive, computed from gate openings and lake elevations at Old Forge dam; Apr. 18 to Sept. 25, from a rating curve well defined by six measurements made with the brush lodged on the control. New curve applicable for remainder of the year defined by six measurements made after control was cleared. Final rating curve does not coincide with curve used before Apr. 17.

Monthly discharge of Middle Branch of Moose River at Old Forge, N. Y., for 1913.

[Drainage area, 51.5 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	143	10	39.9	0.775	0.89	B.
February	83	70	74.6	1.45	1.51	B.
March	760	72	269	5.22	6.02	B.
April	641	58	247	4.80	5.36	B.
May	194	25	65.6	1.27	1.46	A.
June	91	16	35.8	.695	.78	B.
July	67	18	24.9	.483	.56	B.
August	67	56	65.5	1.27	1.46	A.
September	64	57	60.3	1.17	1.30	A.
October	150	60	118	2.29	2.64	A.
November	279	127	194	3.77	4.21	A.
December	120	9.0	17.9	.348	.40	B.
The year	760	9.0	101	1.96	26.59	

NOTE.—Estimates indicate flow as regulated by Old Forge dam at the outlet of Fulton Chain lakes.

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STREAMS TRIBUTARY TO ST. LAWRENCE RIVER.

EAST BRANCH OF OSWEGATCHIE RIVER AT NEWTON FALLS, N. Y.

Location.—600 feet below lower dam of the Newton Falls Paper Co., in village of Newton Falls, 4 miles above the mouth of Little River, and 10 miles below the outlet of Cranberry Lake.

Records available.—October 6, 1912, to December 31, 1913.

Drainage area.—166 square miles.[1]

Gage.—Vertical staff, read daily, morning and evening, to half-tenths. Limits of use: Hundredths below 0.5, half-tenths from 0.5 to 2.5, and tenths above 2.5 feet.

Control.—River bed consists of small bowlders and gravel covered with waste from pulp mill.

Discharge measurements.—At low stages made by wading; high-water measurements made from cable 30 feet above gage.

Winter flow.—Effect of ice on discharge relation is diminished by operation of the paper mill.

Regulation.—Some daily fluctuation—probably not enough to affect accuracy of records—caused by dams of the paper mill. Seasonal flow largely controlled by dam at Cranberry Lake. Range of gage heights probably not more than 5 feet.

Floods.—Crest of flood of March, 1913, as recorded by gage observer and later verified from high-water marks by engineers of the Geological Survey, occurred on afternoon of March 28; crest gage height, 6.1 feet; corresponding discharge approximately 2,000 second-feet, or 12 second-feet per square mile of drainage area. Mean discharge for the five days, March 27–31, 1,820 second-feet, or 10 second-feet per square mile of drainage area.

Accuracy.—Discharge curve well defined for ordinary stages. No high-water measurements yet made. Estimates good.

Cooperation.—Gage readings furnished by Newton Falls Paper Co.

Discharge measurements of East Branch of Oswegatchie River at Newton Falls, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Mar. 14	R. S. Barnes	1.99	342
Apr. 16	....do	2.90	565

[1] Computed by engineers of the State of New York Conservation Commission from forestry, highway, and county maps. Probably more accurate than estimate previously published.

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Daily gage height, in feet, of East Branch of Oswegatchie River at Newton Falls, N. Y., for 1913.

[Chas. H. Corp, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.4	3.3	2.0	5.6	1.95	1.5	1.6	2.0	1.6	1.9	2.3	2.3
2	2.1	3.1	.48	5.2	1.95	2.4	1.75	2.0	1.9	1.9	1.15	2.25
3	1.95	3.0	2.35	5.0	1.95	2.35	1.5	.6	1.9	1.9	2.2	2.15
4	2.4	2.9	2.3	5.2	.8	2.35	.10	1.70	1.9	1.9	2.2	1.9
5	2.2	2.8	2.05	5.2	2.0	2.3	.....	2.15	1.9	.45	2.15	2.05
6	3.1	2.8	1.95	5.2	1.95	1.95	.....	2.1	2.1	2.0	2.0	2.26
7	2.9	2.7	1.95	5.2	1.95	2.1	.....	2.1	.85	1.9	1.9	.95
8	2.8	2.6	1.75	4.9	1.95	1.75	.....	2.1	1.9	1.95	1.9	2.3
9	2.8	.....	.7	4.6	2.1	2.45	2.3	2.1	2.2	1.9	.7	2.3
10	2.8	.....	2.1	4.5	1.95	2.1	2.15	.45	2.2	1.9	2.5	2.05
11	3.0	.....	2.15	4.2	.28	2.1	2.15	1.5	2.2	1.85	2.3	2.05
12	3.2	.....	2.3	3.8	1.7	2.0	2.15	1.85	2.2	.42	2.3	2.3
13	3.4	.....	2.1	3.4	1.75	2.0	1.5	1.85	2.0	1.6	2.3	2.3
14	3.1	.....	2.1	3.0	1.75	1.9	2.0	1.9	.48	2.1	2.35	.8
15	3.1	.....	2.45	2.6	1.65	1.75	2.15	1.9	1.5	1.95	2.35	2.3
16	3.1	.....	3.0	2.6	1.65	2.2	1.85	1.9	1.9	1.9	1.1	2.3
17	3.4	.....	3.4	2.5	1.65	2.0	1.85	.42	1.9	1.85	2.25	2.3
18	3.7	.....	3.4	2.5	.29	2.0	1.9	1.6	1.9	1.85	2.2	2.3
19	3.8	2.3	3.3	2.45	1.7	2.5	2.1	1.95	1.9	.30	2.3	2.3
20	3.8	2.3	3.4	1.8	1.65	2.35	.55	1.95	1.9	1.9	2.6	2.05
21	4.4	2.4	3.6	2.4	1.65	1.9	2.4	1.95	.8	2.05	2.7	.10
22	4.4	2.6	4.0	2.35	1.7	.6	2.5	1.95	1.8	2.25	2.3	1.8
23	4.4	1.3	4.0	2.4	1.7	1.65	2.3	1.95	2.1	2.4	2.1	2.06
24	4.4	2.3	4.2	2.35	1.9	1.6	2.05	.8	2.15	2.6	2.3	1.9
25	4.3	2.3	4.6	2.6	.12	1.6	1.85	.7	2.25	2.8	2.2	.8
26	4.1	2.3	5.3	2.8	1.8	1.6	1.85	1.9	2.1	2.8	2.2	1.45
27	4.0	2.3	5.6	1.0	1.95	1.7	.20	1.95	1.9	3.0	2.1	1.7
28	3.8	2.2	6.0	2.4	2.5	1.7	1.5	1.9	.45	2.9	2.0	1.7
29	3.6	.....	6.0	2.35	2.4	.30	1.95	1.9	1.55	2.8	2.0	1.7
30	3.5	.....	5.8	2.15	2.3	1.65	1.95	1.9	2.0	2.8	2.0	1.7
31	3.4	.....	6.0	.....	2.3	.....	2.00	.40	.....	2.3	.....	1.85

NOTE.—Observations suspended because of ice Feb. 9–18, inclusive, and because of brush lodged on control July 5–8, inclusive. Gage height determined from two observations per day weighted from records of time of changing wheels and gates at paper mill.

Daily discharge, in second-feet, of East Branch of Oswegatchie River at Newton Falls, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	394	678	290	1,680	278	183	202	290	202	266	366	366
2	314	610	55	1,480	278	394	233	290	266	266	127	353
3	278	576	380	1,380	278	380	183	65	266	266	340	327
4	394	544	366	1,480	84	380	80	222	266	266	340	266
5	340	512	302	1,480	290	366	180	327	266	53	327	302
6	610	512	278	1,480	278	278	80	314	314	299	299	353
7	544	482	278	1,480	278	314	220	314	90	266	266	101
8	512	452	233	1,330	278	233	300	314	266	278	266	366
9	512	440	74	1,200	314	408	366	314	340	266	74	366
10	512	423	314	1,150	278	314	327	53	340	266	422	362
11	576	410	327	1,020	41	314	327	183	340	255	366	302
12	644	400	366	862	222	290	327	255	340	51	366	366
13	714	390	314	714	233	290	183	255	290	202	366	366
14	610	385	314	576	233	266	290	266	55	314	380	84
15	610	380	408	452	212	233	327	266	183	278	380	366
16	610	377	576	452	212	340	255	266	266	266	120	366
17	714	373	714	422	212	290	255	51	266	255	353	366
18	824	370	714	422	37	290	266	202	266	255	340	366
19	862	366	678	408	222	422	314	278	266	42	366	366
20	862	366	714	244	212	380	61	278	266	266	452	302
21	1,100	394	786	394	212	266	394	278	84	302	452	30
22	1,100	452	940	380	222	65	422	278	244	353	366	244
23	1,100	149	940	394	222	212	366	278	314	394	314	302
24	1,100	366	1,020	380	266	202	302	84	327	452	366	366
25	1,060	366	1,200	452	31	202	255	74	353	512	340	84
26	980	366	1,530	512	244	202	255	266	314	512	340	174
27	940	366	1,680	107	278	222	36	278	266	576	314	222
28	862	340	1,890	394	422	222	183	266	53	544	290	222
29	786	.....	1,890	380	394	42	278	266	192	512	290	222
30	750	.....	1,780	327	366	212	278	266	290	512	290	222
31	714	.....	1,890	.....	366	.....	290	49	.....	366	.....	255

NOTE.—Discharge Feb. 9–18, inclusive, estimated by interpolation, due consideration being given to temperature and precipitation. Discharge July 5–8 estimated.

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Monthly discharge of East Branch of Oswegatchie River at Newton Falls, N. Y., for 1913.

[Drainage area, 166 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	1,100	278	707	4.26	4.91	A.
February	678	149	423	2.55	2.66	B.
March	1,890	55	750	4.52	5.21	B.
April	1,680	107	781	4.70	5.24	B.
May	422	31	242	1.46	1.68	A.
June	422	42	274	1.65	1.84	A.
July	422	30	251	1.51	1.74	A.
August	327	49	232	1.40	1.61	A.
September	353	53	253	1.52	1.70	A.
October	576	42	313	1.89	2.18	A.
November	482	74	323	1.95	2.18	A.
December	366	30	277	1.67	1.92	A.
The year	1,890	30	402	2.42	32.87	

NOTE.—Estimates indicate flow as regulated by Cranberry Lake Dam and paper mills above station.

OSWEGATCHIE RIVER NEAR OGDENSBURG, N. Y.

Location.—At steel highway bridge known locally as Eel Weir Bridge, about 1 mile below mouth of outlet of Black Lake, and 5½ miles above city of Ogdensburg and mouth of river.

Records available.—April 22,1903, to December 31, 1913. Data published also in annual reports of the State of New York Conservation Commission and New York State engineer and surveyor.

Drainage area.—1,580 square miles.

Gage.—Chain, fastened to upstream side of the bridge; read daily, morning and evening, to tenths. Limits of use: Half-tenths below 6.0 and tenths above 6.0 feet.

Control.—Practically permanent. Channel rocky and partly artificial, the rock having been removed underneath the bridge by blasting to increase the bridge opening.

Discharge measurements.—Usually made from the bridge.

Regulation.—Two dams in vicinity of gage; one at Heuvelton, about 5 miles above, and one at Rensselaer Fall, 10 miles above. Seasonal distribution of flow somewhat affected by operation of dam at Cranberry Lake.

Winter flow.—Discharge relation not affected by ice.

Floods.—Highest recorded stage of flood of March, 1913, occurred on afternoon of March 31, the gage height being 9.9 feet, and the corresponding discharge approximately 18,000 second-feet, or 11.4 second-feet per square mile of drainage area.

Accuracy.—Rating curve fairly well defined; open-water curve used throughout year.

Discharge measurements of Oswegatchie River near Ogdensburg, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Aug. 23[a]	C. S. De Golyer	4.66	454	Oct. 31	G. H. Canfield	6.46	3,530
23[a]	do	4.63	411	Dec. 6	C. S. De Golyer	5.89	2,380
Oct. 29	G. H. Canfield	6.52	3,760	6	do	5.89	2,320

[a] Measurement made by wading.

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Daily gage height, in feet, of Oswegatchie River near Ogdensburg, N. Y., for 1913.

[Joseph H. La Rue, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.1	7.5	5.5	9.7	5.5	5.85	5.0	4.8	4.5	4.6	6.6	6.1
2	6.2	7.4	5.5	9.4	5.5	5.7	4.9	4.7	4.5	4.75	6.1	6.0
3	6.2	7.2	5.5	9.2	5.4	5.7	4.9	4.7	4.6	4.8	6.1	6.0
4	6.6	7.1	5.5	9.2	4.4	5.7	4.9	4.75	4.6	4.8	6.1	6.1
5	7.0	7.0	5.4	9.4	5.35	5.65	4.9	4.7	4.6	4.8	6.1	6.0
6	7.0	6.7	5.4	9.2	5.3	5.5	4.85	4.7	4.6	4.8	6.0	5.9
7	7.0	6.5	5.4	9.2	5.1	5.5	4.8	4.7	4.6	4.8	5.9	5.95
8	7.1	6.2	5.3	9.2	5.0	5.45	4.8	4.7	4.6	4.8	5.9	6.0
9	7.0	6.2	5.3	9.0	5.0	5.5	4.7	4.7	4.5	4.9	5.6	5.9
10	7.0	6.1	5.3	8.8	5.0	5.5	4.7	4.6	4.55	4.9	6.0	5.9
11	7.0	6.0	5.3	8.5	5.0	5.5	4.7	4.6	4.6	4.9	6.2	5.9
12	7.0	6.0	5.4	8.2	5.0	5.5	4.7	4.7	4.6	4.9	6.2	5.9
13	7.0	5.9	5.4	8.0	5.0	5.5	4.7	4.7	4.6	4.8	6.4	5.8
14	7.2	5.8	6.5	7.9	5.0	5.3	4.7	4.65	4.6	4.8	6.5	5.9
15	7.2	5.7	7.7	7.6	4.9	5.3	4.7	4.6	4.6	4.8	6.5	5.9
16	7.2	5.6	8.3	7.4	4.9	5.3	4.7	4.7	4.6	4.8	6.5	5.9
17	7.2	5.6	8.7	7.0	4.9	5.25	4.7	4.6	4.6	4.8	6.5	6.0
18	7.5	5.6	8.8	6.8	4.9	5.2	4.7	4.6	4.6	4.8	6.2	5.95
19	8.2	5.4	8.8	6.6	4.9	5.2	4.7	4.6	4.6	4.8	6.1	5.8
20	8.7	5.4	8.8	6.4	4.9	5.1	4.7	4.6	4.6	5.0	6.2	5.9
21	9.2	5.4	8.5	6.4	4.9	5.0	4.75	4.6	4.6	5.3	6.2	6.0
22	9.4	5.4	8.4	6.2	4.9	5.0	4.8	4.6	4.7	5.4	6.5	5.95
23	9.4	5.5	8.2	6.2	4.9	5.0	4.8	4.6	4.7	5.9	6.6	5.85
24	9.4	5.6	8.2	6.0	4.9	5.0	4.8	4.6	4.7	6.0	6.6	5.8
25	9.2	5.6	7.9	5.8	4.9	5.0	4.8	4.6	4.7	6.1	6.4	5.8
26	9.1	5.5	8.0	5.7	4.9	5.0	4.8	4.6	4.7	6.1	6.4	5.6
27	8.7	5.5	8.4	5.7	4.9	4.9	4.8	4.6	4.7	6.4	6.4	5.75
28	8.5	5.5	8.8	5.6	5.05	4.85	4.8	4.6	4.7	6.6	6.4	5.65
29	8.2	.....	9.2	5.6	5.25	4.9	4.8	4.6	4.7	6.6	6.4	5.6
30	7.9	.....	9.4	5.5	5.5	4.9	4.8	4.6	4.65	6.6	6.2	5.55
31	7.6	.....	9.8	.....	5.65	.....	4.8	4.6	.....	6.5	.....	5.5

NOTE.—Discharge relation not affected by ice.

Daily discharge, in second-feet, of Oswegatchie River near Ogdensburg, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3,730	7,850	2,180	16,500	1,620	2,260	850	600	300	390	3,930	2,770
2	4,020	7,550	2,180	14,800	1,620	1,970	720	490	300	545	2,770	2,560
3	4,020	6,960	2,180	13,800	1,450	1,970	720	490	390	600	2,770	2,560
4	5,180	6,660	2,180	13,800	1,450	1,970	720	545	390	600	2,770	2,770
5	6,360	6,360	1,970	14,800	1,370	1,880	720	490	390	600	2,770	2,560
6	6,360	5,480	1,970	13,800	1,290	1,620	660	490	390	600	2,560	2,360
7	6,360	4,890	1,970	13,800	990	1,620	600	490	390	600	2,360	2,460
8	6,660	4,020	1,770	13,800	850	1,540	600	490	390	600	2,360	2,560
9	6,360	4,020	1,770	12,800	850	1,620	490	490	300	720	1,790	2,360
10	6,360	3,730	1,770	11,800	850	1,620	490	390	345	720	2,560	2,360
11	6,360	3,440	1,770	10,500	850	1,620	490	390	390	720	2,990	2,360
12	6,360	3,440	1,970	9,210	850	1,620	490	490	390	720	2,990	2,360
13	6,360	3,160	1,970	8,400	850	1,620	490	490	390	600	3,440	2,160
14	6,960	2,890	4,890	8,020	850	1,290	490	440	390	600	3,680	2,360
15	6,960	2,640	8,450	6,940	720	1,290	490	390	390	600	3,680	2,360
16	6,960	2,400	10,300	6,250	720	1,290	490	490	390	600	3,680	2,360
17	6,960	2,400	11,500	5,010	720	1,220	490	390	390	600	3,680	2,560
18	7,850	2,400	11,800	4,460	720	1,140	490	390	390	600	2,990	2,460
19	9,960	1,970	11,800	3,930	720	1,140	490	390	390	600	2,770	2,160
20	11,500	1,970	11,800	3,440	720	990	490	390	390	850	2,990	2,360
21	13,000	1,970	10,900	3,440	720	850	545	390	390	1,290	2,990	2,560
22	13,600	1,970	10,600	2,990	720	850	600	390	490	1,450	3,680	2,460
23	13,600	2,180	9,960	2,990	720	850	600	390	490	2,360	3,930	2,260
24	13,600	2,400	9,960	2,560	720	850	600	390	490	2,560	3,930	2,160
25	13,000	2,400	9,050	2,160	720	850	600	390	490	2,770	3,440	2,160
26	12,700	2,180	9,350	1,970	720	850	600	390	490	2,770	3,440	1,790
27	11,500	2,180	10,600	1,970	720	720	600	390	490	3,440	3,440	2,080
28	10,900	2,180	11,800	1,790	920	660	600	390	490	3,930	3,440	1,880
29	9,960	.....	13,000	1,790	1,220	720	600	390	490	3,930	3,440	1,790
30	9,050	.....	13,600	1,620	1,620	720	600	390	440	3,930	2,990	1,700
31	8,150	.....	14,900	.....	1,880	.....	600	390	.....	3,680	.....	1,620

NOTE.—Discharge measurements made during 1913 indicate a change in rating curve; new curve is used beginning Apr. 1, 1913.

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Monthly discharge of Oswegatchie River near Ogdensburg, N. Y., for 1913.

[Drainage area, 1,580 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	13,600	3,730	8,410	5.32	6.13	B.
February	7,850	1,970	3,630	2.30	2.40	C.
March	14,900	1,770	7,090	4.49	5.18	B.
April	16,500	1,620	7,640	4.84	5.40	B.
May	1,880	720	992	.628	.72	C.
June	2,260	660	1,310	.829	.92	B.
July	850	490	581	.368	.42	B.
August	600	390	436	.276	.32	B.
September	490	300	408	.258	.29	B.
October	3,930	390	1,440	.911	1.05	B.
November	3,930	1,790	3,140	1.99	2.22	B.
December	2,770	1,620	2,300	1.46	1.68	B.
The year	16,500	300	3,110	1.97	26.73	

RAQUETTE RIVER AT PIERCEFIELD, N. Y.

Location.—About three-fourths of a mile above head of Black Rapids and half a mile below dam of International Paper Co. at Piercefield.

Records available.—August 20, 1908, to December 31, 1913. Data also in annual reports of the State of New York Conservation Commission and the New York State engineer and surveyor.

Drainage area.—723 square miles.[1]

Gage.—Stevens automatic gage installed in 1912. Limits of use: Hundredths below 3.5, half-tenths from 3.5 to 7.5, and tenths above 7.5 feet. August 20, 1908, to September 3, 1910, vertical staff fastened to a large pine stump; September 4 to December 31, 1912, chain gage fastened to same stump. Datum of chain gage lowered 2 feet January 1, 1911. Automatic gage is in galvanized sheet-iron house, 4 feet by 6 feet (inside dimensions), and is set over a concrete well 3½ feet square (inside dimensions) and 15 feet deep. Well connected with river by a 4-inch cast-iron pipe 60 feet long. A shear gate valve is set at inner end of pipe for use in cleaning well. Outer end of pipe terminates in a concrete box 1 foot square (inside dimensions), connected with river by three small intake pipes 2 inches in diameter, with outer ends screened. The special construction was considered necessary to keep wood pulp out of intake pipe.

Control.—Head of Black Rapids. Channel opposite gage is a deep pond in which velocity is imperceptible.

Discharge measurements.—Made from cable just above Black Rapids at section formerly used for boat measurements.

Winter flow.—Rapids controlling stream at gage rarely freeze; measurements indicate that discharge relation is little, if any, affected by ice. Open-water rating curve usually applicable throughout year.

Regulation.—Low-water flow controlled by dam of International Paper Co., but mill is usually run for 24 hours each day, except Sundays. Numerous lakes in upper part of drainage basin afford considerable storage, most of which is controlled.

Floods.—Spring flood of 1913 rached maximum stage of 11.68 feet at 3 a. m. April 1, as indicated by the recording gage; corresponding discharge, 7,100 second-feet, or 9.8 second-feet per square mile of drainage area.

[1] All but 16 square miles measured on United States Geological Survey topographic atlas sheets.

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Accuracy.—Rating curve well defined. With fluctuations due to regulation recorded by automatic gage, estimates are good.

Cooperation.—Recording gage is attended by an employee of the International Paper Co.

Discharge measurements of Raquette River at Piercefield, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Feb. 27[a]	C. S. DeGolyer	5.50	1,110	Dec. 10	C. S. DeGolyer	6.23	1,460
Apr. 8	R. S. Barnes	11.07	6,380	11	do	6.38	1,600
12	O. W. Hartwell	10.10	5,300	30	W. S. Easterly	5.36	980
Oct. 1	W. S. Easterly	3.34	252				

[a] Complete ice cover at gage; control open.

Daily gage height, in feet, of Raquette River at Piercefield, N. Y., for 1913.

[W. B. Graves, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.9	7.7	5.35	11.6	7.4	6.0	4.95	3.6	1.00	.....	.....	.....
2	5.85	7.4	4.1	11.6	7.3	5.95	4.95	2.95	.88	.....	.....	.....
3	5.9	7.45	5.35	11.5	7.15	5.8	5.0	2.64	.90	.....	.....	.....
4	5.8	7.15	5.55	.....	6.95	5.9	5.0	3.55	.94	.....	.....	.....
5	5.15	6.95	5.05	.....	6.85	6.05	4.9	2.36	1.08	.....	.....	.....
6	5.7	6.6	5.0	.....	6.75	5.85	4.9	4.1	1.28	.....	.....	.....
7	5.7	6.75	5.05	.....	6.6	6.2	3.37	4.1	1.76	.....	5.5	.....
8	6.1	6.5	5.05	11.0	6.6	6.15	4.75	3.7	2.79	.....	.....	.....
9	6.2	6.5	4.15	10.8	6.5	6.15	5.0	2.75	2.91	.....	.....	.....
10	6.2	6.4	4.2	10.5	6.25	6.25	4.75	3.85	2.37	.....	.....	6.2
11	6.3	6.4	5.25	10.3	6.0	5.65	4.2	4.05	2.14	.....	.....	6.2
12	6.2	6.0	5.0	10.1	6.05	6.20	4.15	2.82	1.83	.....	.....	6.3
13	6.7	.....	5.05	9.9	5.85	6.1	2.57	4.15	1.79	.....	.....	6.25
14	6.7	.....	5.0	9.3	4.8	5.85	3.7	3.18	1.83	.....	.....	5.9
15	6.8	.....	5.1	9.2	4.8	6.10	3.85	2.34	1.88	.....	.....	6.05
16	6.8	.....	.....	9.2	5.2	6.0	3.65	2.20	2.06	.....	.....	6.1
17	6.95	.....	.....	9.0	5.15	6.0	4.15	1.92	1.98	.....	.....	6.2
18	7.2	.....	.....	8.9	3.8	5.8	4.2	3.95	1.98	.....	.....	6.2
19	7.1	.....	6.75	8.7	4.55	5.8	4.2	3.9	2.17	.....	.....	6.1
20	7.6	.....	6.9	8.3	5.15	5.35	4.2	3.12	2.23	.....	.....	5.75
21	7.8	.....	7.15	8.4	5.15	5.8	4.15	3.27	2.28	.....	7.0	4.55
22	8.0	.....	7.45	8.2	5.2	5.6	3.75	2.59	2.17	.....	.....	5.45
23	8.0	.....	7.5	8.1	5.0	5.55	4.0	1.91	2.29	.....	.....	5.75
24	8.1	.....	8.0	8.0	5.3	5.55	4.0	3.09	2.33	4.5	.....	5.6
25	8.1	.....	8.5	8.0	4.2	5.55	2.59	3.12	3.02	.....	.....	3.25
26	8.0	.....	9.0	7.8	4.2	5.6	2.93	2.78	3.45	.....	.....	5.4
27	8.1	5.2	9.4	7.6	5.85	5.25	2.70	2.62	3.5	.....	.....	5.95
28	8.0	5.05	9.9	7.6	5.75	4.2	3.04	2.21	3.46	.....	.....	4.4
29	7.9	.....	10.4	7.5	5.65	5.2	4.1	2.49	2.93	.....	.....	5.45
30	7.8	.....	10.8	7.5	5.55	5.4	4.1	2.40	3.07	.....	.....	5.45
31	7.7	.....	11.2	.....	5.8	.....	3.9	1.82	.....	.....	.....	5.35

NOTE.—Discharge relation not affected by ice. Gage height computed from mean of 24 hourly gage heights for each day.

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Daily discharge, in second-feet, of Raquette River at Piercefield, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,350	2,840	1,020	6,970	2,420	1,320	770	313	15	.....	.....	.....
2	1,320	2,560	515	6,970	2,320	1,290	770	176	11	.....	.....	.....
3	1,350	2,600	1,020	6,910	2,180	1,200	790	132	12	.....	.....	.....
4	1,280	2,940	1,130	6,810	2,010	1,260	790	380	13	.....	.....	.....
5	918	2,160	872	6,700	1,930	1,350	750	101	18	.....	.....	.....
6	1,220	1,380	850	6,590	1,850	1,220	750	455	27	.....	.....	.....
7	1,220	1,980	872	6,460	1,740	1,450	258	455	53	.....	1,030	.....
8	1,490	1,780	872	6,310	1,740	1,420	690	339	151	.....	.....	.....
9	1,560	1,780	530	6,080	1,660	1,420	790	146	109	.....	.....	.....
10	1,360	1,700	545	5,740	1,480	1,480	690	381	102	.....	.....	1,450
11	1,630	1,700	965	5,500	1,320	1,110	485	440	81	.....	.....	1,450
12	1,560	1,420	850	5,280	1,350	1,450	470	155	57	.....	.....	1,520
13	1,940	.....	872	5,040	1,230	1,380	124	470	54	.....	.....	1,480
14	1,940	.....	850	4,380	710	1,230	339	218	57	.....	.....	1,260
15	2,020	.....	895	4,270	710	1,380	381	99	61	.....	.....	1,350
16	2,020	.....	1,090	4,270	890	1,330	326	86	74	.....	.....	1,380
17	2,160	.....	1,400	4,050	858	1,320	470	64	68	.....	.....	1,450
18	2,380	.....	1,650	3,940	367	1,260	485	410	68	.....	.....	1,450
19	2,200	.....	1,980	3,780	610	1,200	485	395	83	.....	.....	1,380
20	2,740	.....	2,110	3,310	858	955	485	206	89	.....	.....	1,170
21	2,940	.....	2,340	3,420	858	1,200	470	237	89	.....	2,060	610
22	3,140	.....	2,600	3,210	880	1,080	353	126	83	.....	.....	1,000
23	3,140	.....	2,650	3,110	790	1,080	425	68	94	.....	.....	1,170
24	3,240	.....	3,140	3,010	930	1,060	425	200	98	590	.....	1,080
25	3,240	.....	3,640	3,010	495	1,080	126	206	188	.....	.....	232
26	3,140	.....	4,140	2,810	485	1,080	172	149	276	.....	.....	980
27	3,240	940	4,540	2,610	1,230	905	139	129	288	.....	.....	1,290
28	3,140	872	5,080	2,610	1,170	485	191	87	279	.....	.....	555
29	3,040	.....	5,630	2,510	1,110	880	455	115	172	.....	.....	1,000
30	2,940	.....	6,070	2,510	1,060	980	455	105	197	.....	.....	1,000
31	2,840	.....	6,510	.....	1,200	.....	395	56	.....	.....	.....	955

NOTE.—Discharge Mar. 16–18 and Apr. 4–7, estimated. Discharge Feb. 13–26 and Oct. 1 to Dec. 9, estimated by comparison with records of flow at Massena Springs.

Monthly discharge of Raquette River at Piercefield, N. Y., for 1913.

[Drainage area, 723 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	3,240	918	2,190	3.03	3.49	A.
February	2,840	872	1,540	2.13	2.22	B.
March	6,510	515	2,170	3.00	3.46	A.
April	6,970	2,510	4,600	6.36	7.10	A.
May	2,420	485	1,240	1.72	1.98	A.
June	1,480	485	1,190	1.65	1.84	A.
July	790	124	474	.656	.76	B.
August	470	56	220	.304	.35	B.
September	288	11	101	.140	.16	C.
October	.....	.....	411	.569	.66	D.
November	.....	.....	1,260	1.74	1.94	D.
December	.....	.....	1,220	1.69	1.95	B.
The year	6,970	11	1,390	1.91	25.99	

NOTE.—Estimates indicate flow as regulated by paper-mill dam and numerous lakes immediately above the station. See footnote to table of daily discharge.

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RAQUETTE RIVER AT MASSENA SPRINGS, N. Y.

Location.—At highway bridge at Massena Springs, N. Y., 1,000 feet above New York Central & Hudson River Railroad bridge used for freight transfer from railroad station to Massena power plant, 8 miles below Raymondville, and 10 miles above mouth of stream.

Records available.—September 21, 1903, to October 17, 1903; April 9, 1904, to December 31, 1913. Data also in annual reports of the State of New York Conservation Commission and the New York State engineer and surveyor.

Drainage area.—1,170 square miles.

Gage.—Chain gage on concrete bridge. Original gage, a vertical staff on stone wall on left bank about 50 feet upstream from present bridge, was replaced by standard chain gage August 16, 1906, fastened to an old highway bridge just above present bridge. Chain gage was set at datum 1.00 lower than that of the staff gage to avoid negative readings. Chain gage reset in present position February 2, 1912, at such a datum that readings should be comparable with those at the old highway bridge. Gage read daily, morning and evening, to half-tenths. Limits of use: Hundredths below 1.5, half-tenths from 1.5 to 2.5, and tenths above 2.5 feet.

Control.—Fairly permanent. Bed of river of coarse gravel and small bowlders.

Discharge measurements.—Made from new bridge to which gage is attached; formerly made from old highway bridge.

Regulation.—Operation of a number of power plants—usually run for 24-hour power but closed on Sundays—above station has marked effect on low-water discharge. Effect of Sunday closing is apparent in the stream for several days.

Winter flow.—Discharge relation not seriously affected by ice during the very mild winter of 1912–13.

Floods.—Maximum stage of spring flood of 1913, as determined from high-water marks by engineers of the Geological Survey, was at gage height 14.2 feet and noted by the gage observer between 9 and 11 a. m. March 31. Corresponding discharge, approximately 16,500 second-feet, or 14.1 second-feet per square mile of drainage area.

Accuracy.—Conditions are fair at the new bridge, but the rating curve has changed somewhat. Determinations of monthly discharge for low-water periods considered erroneous because of artificial regulation of flow.

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Discharge measurements of Raquette River at Massena Springs, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Apr. 5	R. S. Barnes	13.30	14,900	Aug. 29[a]	C. S. De Golyer	1.66	306
5	do	13.26	14,900	Dec. 8	do	3.85	1,910
17	do	7.38	5,740	9	do	4.39	2,270
Aug. 22[a]	C. S. De Golyer	1.64	294				

[a] Measurement made by wading.

Daily gage height, in feet, of Raquette River at Massena Springs, N. Y., for 1913.

[F. L. Babcock, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.2	8.0	5.5	11.1	5.0	.....	.....	.....	1.40	1.65	3.9	4.8
2	6.2	8.0	5.4	11.3	4.9	.....	.....	.....	1.30	1.65	3.2	4.8
3	6.8	7.8	5.4	11.6	4.6	.....	.....	.....	1.45	1.70	3.5	4.9
4	7.0	7.8	5.4	12.6	4.6	.....	.....	.....	1.25	1.65	3.7	4.2
5	7.0	7.6	5.6	13.5	4.4	.....	.....	.....	1.20	1.45	3.6	4.4
6	6.8	7.4	5.4	12.8	4.2	.....	.....	.....	1.15	1.50	3.4	4.4
7	6.8	7.4	5.4	11.7	4.2	.....	.....	.....	1.00	1.60	3.6	4.6
8	6.7	7.2	5.2	10.6	4.0	.....	.....	.....	1.05	1.35	3.6	4.0
9	6.6	7.0	5.4	9.6	4.0	.....	.....	.....	1.10	1.35	3.2	3.6
10	6.8	6.8	5.4	9.2	3.8	.....	.....	.....	1.20	1.10	3.6	4.4
11	6.8	6.8	5.5	9.1	3.6	.....	.....	.....	1.30	1.10	4.0	4.5
12	7.0	6.5	5.6	8.8	3.6	.....	.....	.....	1.50	1.10	3.8	4.4
13	7.3	6.2	5.6	8.2	3.6	.....	1.85	.....	1.60	.85	3.8	4.6
14	7.7	6.2	5.8	7.8	3.4	.....	1.85	.....	1.45	1.80	3.6	4.7
15	7.4	6.0	6.2	7.1	3.4	.....	1.85	.....	1.40	1.60	3.4	4.5
16	7.6	6.0	7.2	7.0	3.3	.....	1.95	.....	.....	.85	4.2	4.5
17	7.9	5.8	8.6	6.8	3.3	.....	2.05	.....	1.40	1.05	4.3	5.5
18	8.0	6.0	9.0	6.6	3.2	.....	2.15	.....	1.35	1.00	4.3	4.6
19	8.3	6.0	9.0	6.7	3.1	.....	2.0	.....	1.50	2.00	4.2	6.0
20	9.8	5.9	9.2	6.6	3.0	.....	2.1	.....	1.20	.80	4.3	5.8
21	10.2	5.8	9.6	6.4	2.8	.....	2.2	.....	.90	1.45	4.6	5.6
22	10.3	5.8	9.8	6.2	2.8	.....	2.1	1.75	1.15	2.00	4.7	6.4
23	10.2	5.7	9.9	6.2	2.6	.....	2.2	1.55	1.45	3.5	4.5	5.7
24	10.1	5.6	10.0	6.1	2.6	.....	2.05	1.05	1.55	2.9	4.9	6.8
25	9.8	5.3	10.0	6.0	2.8	.....	2.0	1.05	1.55	3.4	4.8	5.8
26	9.6	5.4	9.9	5.7	3.0	.....	2.05	1.55	1.50	4.2	4.8	6.0
27	9.0	5.4	10.0	5.6	3.0	.....	1.8	1.7	1.55	4.0	5.0	6.4
28	8.8	5.4	10.0	5.4	3.0	.....	1.7	1.55	1.25	3.8	4.7	5.4
29	8.7	.....	10.1	5.4	3.0	.....	.....	1.65	1.15	3.8	4.8	5.9
30	8.4	.....	10.8	5.2	3.0	.....	.....	1.85	1.35	3.8	5.0	5.8
31	8.2	.....	12.8	.....	3.0	.....	.....	1.6	.....	4.7	.....	.....

NOTE.—This discharge relation probably affected by ice Dec. 17–31. Gage heights June 1 to July 12 and July 28 to Aug. 21, inclusive, omitted because of errors of observation discovered by comparison with records from automatic gage at Piercefield. New gage reader employed beginning Sept. 17, 1913. Records prior to July 1, 1913, compare well with records from automatic gage at Piercefield and are probably reliable. See accuracy column in table of monthly discharge.

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Daily discharge, in second-feet, of Raquette River at Massena Springs, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4,290	6,590	3,520	11,400	2,890	.....	.....	.....	200	300	1,840	2,690
2	4,290	6,590	3,410	11,700	2,790	.....	.....	.....	170	300	1,260	2,690
3	5,020	6,310	3,410	12,200	2,490	.....	.....	.....	220	320	1,500	2,790
4	5,270	6,310	3,410	13,800	2,490	.....	.....	.....	155	300	1,680	2,110
5	5,270	6,040	3,680	15,200	2,290	.....	.....	.....	140	220	1,580	2,290
6	5,020	5,780	3,410	14,100	2,110	.....	.....	.....	125	240	1,420	2,290
7	5,020	5,780	3,410	12,300	2,110	.....	.....	.....	85	280	1,580	2,490
8	4,900	5,520	3,210	10,600	1,980	.....	.....	.....	98	185	1,580	1,930
9	4,770	5,270	3,410	8,960	1,980	.....	.....	.....	100	185	1,260	1,580
10	5,020	5,020	3,410	8,350	1,750	.....	.....	.....	140	110	1,580	2,290
11	5,020	5,020	3,520	8,200	1,580	.....	.....	.....	170	110	1,930	2,390
12	5,270	4,650	3,630	7,750	1,580	.....	.....	.....	240	110	1,750	2,290
13	5,640	4,290	3,630	6,870	1,580	.....	395	.....	280	52	1,750	2,490
14	6,180	4,290	3,850	6,310	1,420	.....	395	.....	220	370	1,580	2,590
15	5,780	4,070	4,290	5,370	1,420	.....	395	.....	200	280	1,420	2,390
16	6,040	4,070	5,520	5,240	1,340	.....	445	.....	200	52	2,110	2,390
17	6,450	3,850	7,450	4,980	1,340	.....	495	.....	200	98	2,200	.....
18	6,590	4,070	8,050	4,720	1,260	.....	550	.....	185	85	2,200	.....
19	7,020	4,070	8,050	4,850	1,180	.....	470	.....	240	470	2,110	.....
20	9,270	3,960	8,350	4,720	1,110	.....	520	.....	140	45	2,290	.....
21	9,910	3,850	8,960	4,470	970	.....	580	.....	63	220	2,490	.....
22	10,100	3,850	9,270	4,230	970	.....	520	345	125	470	2,590	.....
23	9,910	3,740	9,430	4,230	830	.....	580	260	220	1,500	2,390	.....
24	9,750	3,630	9,590	4,110	830	.....	495	98	260	1,040	2,790	.....
25	9,270	3,310	9,590	3,990	970	.....	470	98	260	1,420	2,690	.....
26	8,960	3,410	9,430	3,650	1,110	.....	495	260	240	2,110	2,690	.....
27	8,050	3,410	9,590	3,540	1,110	.....	370	320	260	1,930	2,890	.....
28	7,750	3,410	9,590	3,320	1,110	.....	320	260	155	1,750	2,590	.....
29	7,600	.....	9,750	3,320	1,110	.....	.....	300	125	1,750	2,690	.....
30	7,160	.....	10,900	3,100	1,110	.....	.....	395	185	1,750	2,890	.....
31	6,870	.....	14,100	.....	1,110	.....	.....	280	.....	2,590	.....	.....

NOTE.—Discharge curve slightly changed by flood of March, 1913. New rating table used beginning Apr. 1, 1913. Discharge during February may be slightly large on account of ice. Discharge Dec. 17-31 estimated at 1,660 second-feet by comparison with records of Raquette River at Piercefield. See footnote to table of daily gage heights.

Monthly discharge of Raquette River at Massena Springs, N. Y., for 1913.

[Drainage area, 1,170 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	10,100	4,290	6,690	5.72	6.60	B
February	6,590	3,310	4,650	3.97	4.13	C
March	14,100	3,210	6,480	5.54	6.39	B
April	15,200	8,100	7,190	6.15	6.86	A
May	2,890	830	1,540	1.32	1.52	B
June	.....	.....	1,480	1.26	1.41	C
July	.....	.....	659	.563	.65	C
August	.....	.....	359	.307	.35	C
September	260	63	180	.154	.17	B
October	2,590	52	666	.569	.66	B
November	2,890	1,260	2,040	1.74	1.94	B
December	.....	.....	2,020	1.73	1.99	C
The year	15,300	52	2,820	2.41	32.67	

NOTE.—Discharge for periods for which estimates of daily discharge are not published estimated from records of flow at Piercefield, N. Y.

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ST. REGIS RIVER AT BRASHER CENTER, N. Y.

Location.—At steel highway bridge in village of Brasher Center, 5 miles downstream from Brasher Falls, 6¼ miles below junction of East and West branches of St. Regis River, and about 12 miles above mouth.

Records available.—August 22, 1910, to December 31, 1913.

Drainage area.—621 square miles (measured on post-route map).

Gage.—Chain, fastened to downstream side of bridge; read daily, morning and evening, to quarter-tenths. Limits of use: Hundredths below 4.5, half-tenths from 4.5 to 6.0, and tenths above 6.0 feet.

Control.—Probably permanent. Channel very rough; composed of gravel and large bowlders.

Discharge measurements.—At low stages made by wading at section about 500 feet above bridge; at high stages made from bridge.

Winter flow.—Discharge relation affected by ice.

Floods.—Spring flood of 1913 reached gage height 7.3 feet March 27, as recorded by the morning and afternoon readings of observer. Corresponding discharge, approximately 9,000 second-feet, or 14.5 second-feet per square mile of drainage area.

Accuracy.—Rating curve well defined. Estimates good.

Discharge measurements of St. Regis River at Brasher Center, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Feb. 25[a]	C. S. De Golyer	7.24	906	Apr. 18	R. S. Barnes	5.20	1,550
Mar. 17	R. S. Barnes	9.60	3,900	Aug. 21[b]	C. S. De Golyer	3.86	170
Apr. 4	do	6.89	6,440	21[b]	do	3.86	171

[a] Measurement made under complete ice cover. [b] Measurement made by wading.

Daily gage height, in feet, of St. Regis River at Brasher Center, N. Y., for 1913.

[Joseph Vanier, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.7	5.65	6.8	6.5	5.0	4.95	4.26	4.12	3.82	4.05	4.9	4.65
2	5.45	5.75	6.6	6.3	4.85	4.8	4.20	4.08	3.84	4.12	4.75	4.45
3	5.35	5.9	6.7	5.8	4.55	4.7	4.18	3.98	3.90	4.50	4.65	4.75
4	5.9	5.95	7.0	6.8	4.40	4.7	4.14	4.10	3.90	4.8	4.55	4.9
5	5.6	6.0	7.2	7.1	4.42	4.7	4.10	4.08	3.82	4.85	4.42	4.85
6	5.65	6.3	6.9	6.8	4.45	4.65	4.12	4.20	3.84	4.7	4.42	4.7
7	6.1	6.6	6.8	6.4	4.5	4.65	4.14	4.22	3.81	4.5	4.5	4.8
8	6.6	6.5	6.9	5.9	4.5	4.9	4.18	4.20	3.81	4.38	4.55	4.9
9	7.0	6.6	6.9	5.75	4.5	4.9	4.15	4.12	3.84	4.31	4.6	4.85
10	7.5	6.8	7.1	5.55	4.5	4.8	4.18	4.05	3.85	4.22	4.8	4.7
11	8.0	7.0	7.2	5.65	4.5	4.75	4.10	4.08	3.84	4.18	5.1	4.7
12	7.3	7.3	7.6	5.65	4.45	4.8	4.15	4.08	3.82	4.20	5.05	4.6
13	7.8	7.2	8.4	5.55	4.55	4.7	4.18	4.02	3.90	4.28	4.9	4.55
14	8.3	7.2	10.0	5.4	4.42	4.6	4.12	4.02	3.90	4.28	4.85	4.7
15	8.0	7.3	11.1	5.25	4.40	4.42	4.12	4.01	3.89	4.32	4.8	4.95
16	7.6	7.3	10.8	5.3	4.45	4.40	4.15	4.02	3.86	4.38	4.7	5.15
17	8.1	7.3	9.6	5.2	4.55	4.29	4.15	4.01	3.82	4.30	4.7	4.75
18	9.3	7.4	9.1	5.2	4.55	4.19	4.10	3.95	3.92	4.25	4.6	4.8
19	8.6	7.4	9.0	5.2	4.6	4.32	4.12	3.95	3.92	4.30	4.5	5.25
20	8.4	7.4	8.6	5.15	4.5	4.32	4.08	3.92	3.96	4.38	5.1	4.9
21	8.6	7.8	8.4	5.2	4.6	4.30	4.08	3.90	4.00	5.15	5.4	4.7
22	8.0	7.2	7.2	5.15	4.6	4.31	4.10	3.84	4.15	5.3	5.3	4.6
23	7.5	7.2	6.2	5.2	4.7	4.24	4.02	3.86	4.3	5.3	5.2	4.7
24	7.3	7.4	6.1	5.2	4.8	4.22	4.02	3.85	4.32	5.2	5.1	4.7
25	6.6	7.2	6.3	5.1	4.8	4.22	4.08	3.81	4.32	5.1	5.1	4.6
26	6.3	7.2	6.6	5.05	4.7	4.24	4.08	3.89	4.22	5.1	5.2	4.5
27	5.95	7.1	7.3	4.95	4.7	4.26	4.02	3.95	4.12	5.3	4.95	5.15
28	5.9	6.8	7.2	4.9	4.8	4.26	4.08	4.04	4.06	5.25	4.9	6.0
29	6.0	.....	7.1	4.9	5.15	4.30	4.10	4.04	4.05	5.2	4.85	5.7
30	6.0	.....	7.1	5.0	5.35	4.30	4.18	4.01	4.02	5.1	4.75	5.3
31	5.95	.....	7.0	.....	5.25	.....	4.15	3.99	.....	4.9	.....	5.35

NOTE.—Discharge relation affected by ice during a large part of January and February, Mar. 1-22, and Dec. 27-31, inclusive.

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Daily discharge, in second-feet, of St. Regis River at Brasher Center, N. Y., for 1913.

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	4,700	1,270	1,200	423	322	153	277	1,130	801
2	.....	.....	4,040	1,060	990	376	296	162	322	925	560
3	.....	.....	2,740	690	860	362	235	191	638	801	925
4	.....	.....	5,830	542	860	335	308	191	990	690	1,130
5	.....	.....	7,030	561	860	308	296	153	1,060	561	1,060
6	.....	.....	5,830	590	801	322	376	162	860	561	860
7	.....	.....	4,860	638	801	335	392	148	638	638	990
8	.....	.....	2,960	638	1,130	362	376	148	524	690	1,130
9	.....	.....	2,640	638	1,130	342	322	162	463	742	1,060
10	.....	.....	2,230	638	990	362	277	167	392	990	860
11	.....	.....	2,430	638	925	308	296	162	362	1,430	860
12	.....	.....	2,430	590	990	342	296	153	376	1,350	742
13	.....	.....	2,230	690	860	362	258	191	438	1,130	690
14	.....	.....	1,940	561	742	322	258	191	438	1,060	860
15	.....	.....	1,680	542	561	322	252	186	472	990	1,200
16	.....	.....	1,760	590	542	342	258	172	524	860	1,510
17	.....	a3,900	1,590	690	446	342	252	153	454	860	925
18	.....	.....	1,590	690	369	308	218	202	415	742	990
19	.....	.....	1,590	742	472	322	218	202	454	638	1,680
20	.....	.....	1,510	638	472	296	202	224	524	1,430	1,130
21	.....	.....	1,590	742	454	296	191	246	1,510	1,940	860
22	.....	.....	1,510	742	463	308	162	342	1,760	1,760	742
23	.....	3,740	1,590	860	407	258	172	454	1,760	1,590	860
24	.....	3,460	1,590	990	392	258	167	472	1,590	1,430	860
25	a906	4,040	1,430	990	392	296	148	472	1,430	1,430	742
26	.....	5,060	1,350	860	407	296	186	392	1,430	1,590	638
27	.....	7,880	1,200	860	423	258	218	322	1,760	1,200	.....
28	.....	7,450	1,130	990	423	296	271	283	1,680	1,130	.....
29	.....	7,030	1,130	1,510	454	308	271	277	1,590	1,060	.....
30	.....	7,030	1,270	1,850	454	362	252	258	1,430	925	.....
31	.....	6,620	.....	1,680	.....	342	240	.....	1,130	.....	.....

a Current-meter measurement.

Monthly discharge of St. Regis River at Brasher Center, N. Y., for 1913.

[Drainage area, 621 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	.....	.....	3,550	5.72	6.60	C.
February	.....	.....	2,460	3.96	4.12	C.
March	.....	.....	3,430	5.52	6.36	C.
April	7,030	1,130	2,500	4.03	4.50	A.
May	1,850	542	829	1.34	1.54	A.
June	1,200	369	676	1.09	1.22	A.
July	423	258	325	.523	.60	B.
August	392	148	258	.415	.48	B.
September	472	148	233	.375	.42	B.
October	1,760	277	893	1.44	1.66	A.
November	1,940	561	1,080	1.74	1.94	A.
December	1,680	590	919	1.48	1.71	A.
The year	7,880	148	1,420	2.29	31.15	

NOTE.—Discharge, Jan. 1 to Mar. 22, estimated from two discharge measurements by comparison with records of flow of near-by streams. Discharge Dec. 27-31, estimated at 760 second-feet.

DEER RIVER AT BRASHER IRON WORKS, N. Y.

Location.—About 1,000 feet below steel highway bridge in village of Brasher Iron Works (railroad station is Ironton) and 2 miles above confluence of Deer River with St. Regis River in Helena, N. Y. No important tributaries between gage and mouth of river. A small creek enters from left about 1 mile above station.

Records available.—July 25, 1912, to December 31, 1913. (Records from July 25 to December 31, 1912, published in Water-Supply Paper 324 under "Deer River at Ironton, N. Y.")

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Drainage area.—206 square miles (measured on post-route map).

Gage.—Wooden sloping gage, 32 feet long, reading from 0.5 foot to 11.0 feet, about 1,000 feet below bridge and 500 feet below remains of an old wooden dam. An auxiliary vertical staff gage, fastened on upstream side of right abutment, is to be used as a reference in making measurements and to determine effect of removal of the dam below. Gage read daily, morning and evening, to half-tenths. Limits of use: Hundredths below 2.0, half-tenths from 2.0 to 3.0, and tenths above 3.0 feet.

Control.—Gravel about 300 feet below gage; probably permanent. The stream bed at the bridge is solid rock and is smooth.

Discharge measurements.—At medium and high stages made from bridge; at low stages by wading a short distance above bridge.

Winter flow.—Discharge relation affected by ice.

Floods.—Spring flood of 1913 reached gage height 7.1 feet, as recorded by observer on morning of April 5. Corresponding discharge, approximately 4,500 second-feet, or 21.8 second-feet per square mile of drainage area.

Accuracy.—Rating curve fairly well defined.

Discharge measurements of Deer River at Brasher Iron Works, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Feb. 26[a]	C. S. De Golyer	2.78	134	Apr. 18	R. S. Barnes	2.40	297
Mar. 18	R. S. Barnes	2.90	537	Aug. 20[b]	C. S. De Golyer	0.86	21.8
Apr. 4	do	5.60	2,530	20[b]	do	0.88	24.0
4	do	5.65	2,640				

[a] Measurement made under complete ice cover. [b] Measurement made by wading.

Daily gage height, in feet, of Deer River at Brasher Iron Works, N. Y., for 1913.

[Alex. Barlow, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.4	.....	.....	4.2	1.86	1.20	1.18	1.15	1.06	0.95	1.75	1.88
2	2.9	.....	.....	3.8	1.78	1.96	1.01	1.14	.89	1.14	1.65	1.92
3	3.5	.....	.....	3.4	1.76	1.85	.98	1.08	1.06	1.86	1.64	2.0
4	4.7	.....	.....	5.2	1.67	1.72	.91	1.15	1.06	2.0	1.61	2.3
5	.....	.....	.....	6.6	1.66	1.68	1.05	1.14	1.08	1.75	1.64	2.3
6	.....	.....	.....	4.2	1.70	1.65	1.00	1.25	1.05	1.58	1.60	2.15
7	.....	3.6	2.5	3.6	1.52	1.66	1.05	1.16	1.04	1.52	1.58	1.99
8	.....	.....	.....	3.2	1.48	1.72	1.06	1.10	1.04	1.40	1.50	2.0
9	.....	.....	.....	2.9	1.51	1.74	1.24	1.10	.92	1.35	1.70	2.0
10	3.6	.....	.....	2.7	1.50	1.73	1.12	1.09	.99	1.25	2.4	2.0
11	.....	.....	.....	2.85	1.48	1.64	1.09	1.06	1.02	1.25	2.2	1.95
12	.....	.....	.....	3.2	1.49	1.54	1.16	.95	.90	1.25	2.0	2.1
13	.....	.....	.....	3.1	1.48	1.52	1.12	1.11	.85	1.34	1.91	1.95
14	.....	3.5	8.0	2.75	1.46	1.42	1.18	1.08	.85	1.41	1.85	2.25
15	.....	.....	6.2	2.55	1.50	1.32	1.20	1.08	.98	1.30	1.79	2.6
16	.....	.....	4.5	2.4	1.52	1.36	1.19	1.08	1.02	1.30	1.70	2.4
17	6.8	.....	3.3	2.3	1.56	1.41	1.12	1.04	1.01	1.35	1.60	1.98
18	6.0	.....	2.9	2.25	1.64	1.32	1.08	.94	1.09	1.29	1.59	2.1
19	.....	.....	3.2	2.4	1.70	1.35	1.10	.80	1.14	1.30	1.58	2.05
20	.....	.....	3.2	2.5	1.72	1.29	1.04	.85	1.12	1.48	2.6	2.1
21	.....	4.0	3.4	2.35	1.68	1.40	1.10	.96	1.12	2.65	2.5	1.90
22	.....	.....	3.6	2.15	1.78	1.31	1.12	.96	1.25	2.4	2.3	1.78
23	.....	.....	3.2	2.3	1.82	1.15	1.08	.95	1.30	2.1	2.65	1.90
24	4.0	.....	3.2	2.35	1.74	1.20	1.06	1.10	1.28	1.92	2.35	2.1
25	.....	.....	4.6	2.2	1.75	1.28	1.14	1.12	1.25	2.15	2.2	1.95
26	.....	.....	4.6	2.15	1.68	1.27	1.21	1.02	1.15	2.05	2.0	1.75
27	.....	.....	5.4	2.2	1.68	1.20	1.19	1.15	1.11	2.3	1.90	1.95
28	.....	2.8	5.1	2.1	1.90	1.24	1.18	1.16	1.10	2.1	1.85	2.00
29	.....	.....	4.2	2.0	2.4	1.26	1.25	1.15	1.04	2.0	1.72	2.2
30	.....	.....	5.2	1.92	2.25	1.24	1.22	1.16	.98	1.92	1.79	2.3
31	2.45	.....	5.1	.....	2.1	.....	1.16	1.08	.....	1.90	.....	2.05

NOTE.—Discharge relation affected by ice Jan. 5 to Mar. 16 and Dec. 29–31, inclusive.

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Daily discharge, in second-feet, of Deer River at Brasher Iron Works, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	704	.....	.....	1,190	166	58	56	52	42	30	143	171
2	484	.....	.....	920	149	189	36	51	24	51	124	180
3	754	.....	.....	704	145	164	33	44	42	166	122	199
4	1,590	.....	.....	2,090	128	137	26	52	42	199	117	279
5	.....	.....	.....	3,920	126	129	40	51	44	143	122	279
6	.....	.....	.....	1,190	133	124	35	64	40	112	115	238
7	.....	.....	.....	808	102	126	40	53	59	102	112	197
8	.....	.....	.....	610	96	137	42	46	39	85	99	199
9	.....	.....	.....	484	101	141	63	46	27	78	133	199
10	808	.....	.....	410	99	139	48	45	34	64	309	199
11	.....	.....	.....	465	96	122	45	42	37	64	251	187
12	.....	.....	.....	610	98	105	53	30	25	64	199	226
13	.....	.....	.....	566	96	102	48	47	21	77	177	187
14	.....	.....	.....	428	93	88	56	44	21	86	164	265
15	.....	.....	.....	358	99	74	58	44	33	71	151	375
16	.....	.....	.....	309	102	79	57	44	37	71	133	309
17	4,220	.....	656	279	109	86	48	39	36	78	115	194
18	3,070	.....	484	265	122	74	44	29	45	70	113	225
19	.....	.....	610	309	133	78	46	17	51	71	112	212
20	.....	.....	610	341	137	70	39	.21	48	96	375	225
21	.....	.....	704	294	129	85	46	31	48	392	341	153
22	.....	.....	808	238	149	72	48	31	64	309	279	149
23	.....	.....	610	279	157	52	44	30	71	225	392	175
24	1,050	.....	610	294	141	58	42	46	68	180	294	225
25	.....	.....	1,500	251	143	68	51	48	64	239	251	187
26	.....	134	1,500	238	129	67	59	37	52	212	199	143
27	.....	.....	2,310	251	129	58	57	52	47	279	175	187
28	.....	.....	1,980	225	175	63	56	53	46	225	164	199
29	.....	.....	1,190	199	309	66	64	52	39	199	137	.....
30	.....	.....	2,090	180	265	63	61	53	33	180	151	.....
31	325	.....	1,980	.....	225	.....	53	44	.....	175	.....	.....

Monthly discharge of Deer River at Brasher Iron Works, N. Y., for 1913.

[Drainage area, 206 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	.....	.....	1,000	4.85	5.59	D.
February	.....	.....	693	3.36	3.50	D.
March	.....	.....	955	4.64	5.35	D.
April	3,920	180	624	3.03	3.38	B.
May	309	93	138	.670	.77	A.
June	189	52	96.8	.465	.52	A.
July	64	26	48.2	.234	.27	B.
August	64	17	43.2	.210	.24	B.
September	68	21	42.0	.204	.23	B.
October	392	30	142	.689	.79	A.
Novemebr	392	99	186	.903	1.01	A.
December	375	143	210	1.02	1.18	A.
The year	3,920	17	347	1.68	22.83	

NOTE.—Discharge Jan. 1 to Mar. 16 estimated from one discharge measurement by comparison with records of flow of near-by streams. Discharge Dec. 29–31 estimated.

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LAKE CHAMPLAIN AND ITS TRIBUTARIES.

RICHELIEU RIVER AT FORT MONTGOMERY, ROUSES POINT, N. Y.

Location.—Inside the fort, 1 mile northeast of village of Rouses Point, three-eighths mile south of the international boundary, and about half a mile from head of Richelieu River, the outlet of Lake Champlain.

Records available.—1875 to 1913. Data published also in the reports of the Deep Waterways Survey and annual reports of New York State engineer and surveyor.

Drainage area.—7,870 square miles, including 436 square miles of water surface (from annual report of New York State engineer and surveyor).

Gage.—Staff, read once daily in the morning to half-tenths. Elevation of gage zero at Fort Montgomery, 92.50 feet above mean sea level; high-water level is at elevation 101.6 feet; probably lowest elevation recorded at Fort Montgomery is 91.9 feet, November 13, 1908.

Cooperation.—Gage heights observed under direction of Corps of Engineers, United States Army, and reported weekly to United States Geological Survey.

Daily gage height, in feet, of Richelieu River at Fort Montgomery, Rouses Point, N. Y., for 1913.

Day.	Jan.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.90	7.80	5.60	3.80	2.40	1.50	0.60	0.20	0.75	0.90
2	.....	2.90	7.50	5.50	3.70	2.30	1.40	.60	.25	.55	.80
3	.....	2.80	7.70	5.40	3.80	2.25	1.10	.65	.30	.75	.60
4	2.80	2.70	7.80	5.35	3.60	2.30	1.20	.50	.30	.60	.80
5	.....	2.75	7.80	5.30	3.70	2.15	1.30	.50	.35	.50	.85
6	.....	2.70	7.95	5.10	3.80	2.10	1.40	.55	.45	.70	.75
7	.....	2.65	7.90	4.90	3.40	2.00	1.10	.65	.45	.75	1.00
8	2.70	2.70	7.85	4.80	3.45	1.95	1.30	.45	.40	.80	.95
9	.....	2.65	7.80	4.70	3.40	2.20	1.20	.35	.35	.60	1.00
10	.....	2.60	7.75	4.50	3.40	1.90	1.20	.40	.30	1.20	1.20
11	.....	2.65	7.90	4.40	3.50	1.80	1.05	.30	.60	.70	.70
12	.....	2.60	7.50	4.30	3.30	1.90	1.10	.40	.35	.60	1.20
13	.....	2.75	7.45	4.40	3.50	1.95	1.00	.35	.30	.85	1.10
14	.....	2.85	7.40	4.10	3.20	1.75	1.10	.30	.10	.60	1.00
15	.....	3.25	7.30	4.05	3.15	1.65	1.10	.30	.25	.60	1.10
16	.....	3.60	7.20	4.10	3.05	1.65	1.05	.30	.10	.65	1.15
17	.....	4.00	7.00	4.00	3.00	1.70	.95	.55	.20	.75	1.20
18	.....	4.20	7.50	3.90	2.90	1.65	.80	.20	.50	.75	1.10
19	.....	4.20	6.70	3.80	2.95	1.60	.80	.25	.20	.65	1.10
20	.....	4.15	6.50	3.75	2.90	1.55	.75	.30	.40	.70	1.30
21	.....	4.30	6.70	3.70	2.80	1.50	.80	.40	.50	.70	1.10
22	.....	4.50	6.80	3.80	2.75	1.60	.85	.30	.40	.80	1.05
23	.....	4.70	6.50	3.60	2.70	1.70	.80	.40	1.10	.75	1.00
24	.....	5.30	6.40	3.50	2.70	1.50	.75	.35	.40	.80	1.10
25	.....	4.95	6.30	3.50	2.60	1.40	.70	.50	.30	.70	1.10
26	.....	5.80	6.15	3.50	2.80	1.30	1.00	.55	.35	.65	.....
27	.....	6.10	6.00	3.45	2.55	1.40	.70	.30	.50	.70	1.15
28	.....	6.90	5.90	3.50	2.45	1.35	.65	.50	.60	1.00	1.10
29	.....	7.70	5.75	3.35	2.50	1.40	.80	.30	.60	.75	1.05
30	.....	7.90	5.60	3.70	2.45	1.35	.65	.25	.50	.80	1.15
31	.....	7.60	.....	3.80	.....	1.30	.70	.....	.55	.....	1.05

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SARANAC RIVER NEAR PLATTSBURG, N. Y.

Location.—At the Indian Rapids (Lozier) power plant of the Plattsburg Gas & Electric Co., near Plattsburg, N. Y., and about 6 miles above mouth of river.

Records available.—March 27, 1903, to December 31, 1913.

Drainage area.—607 square miles (measured on United States Geological Survey topographic sheets revised since last report).

Gages.—Crest gage a vertical staff at angle in wing wall at right-hand end of the racks; tailrace gage a vertical staff spiked to crib dike between tailrace and river, about 50 feet below power house.

Determination of discharge.—Discharge computed from flow over a spillway crest 171.25 feet long, through two 5-foot waste gates (when open), and from ratings of two 300 kilowatt alternating current generators. Coefficients for calculation of discharge over dam derived from experiments made at Cornell University hydraulic laboratory on model ogee section of dam. Ratings of waste gates and turbines not available. In 1913 a cable was erected a short distance below the plant and a number of discharge measurements were made with a view to rating the wheels, but it was impossible to operate the plant under all the conditions of load necessary for complete rating. Estimates withheld pending an opportunity to obtain the remainder of the measurements.

Cooperation.—Records furnished by Plattsburg Gas & Electric Co., Herbert A. Stutchbury, superintendent.

Discharge measurements of Saranac River near Plattsburg, N. Y., in 1913.

Date.	Hydrographer.	Gage height.[a]	Discharge.	Date.	Hydrographer.	Gage height.[a]	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
July 26[b]	G. J. Lyon	2.22	347	Aug. 4[d]	G. J. Lyon	2.93	961
27[b]	do	1.66	187	Sept. 2[f]	do	2.18	325
27[b]	do	1.58	168	2[f]	do	1.98	244
27[b]	do	1.62	182	3[f]	do	1.79	204
27[b]	do	1.85	255	3[f]	do	1.66	174
28[b]	do	2.24	353	22[e]	G. H. Canfield	2.20	344
29[b]	do	2.91	556	24[b]	do	2.22	341
29[c]	do	2.70	507	28[b]	do	.64	14.0
31[c]	do	2.78	523	28[b]	do	1.45	135
Aug. 2[d]	do	2.17	562	28[b]	do	.97	45.9
3[d]	do	2.01	415	28[b]	do	1.82	222

[a] Tailrace gage readings.
[b] Measurement made at lower tailrace section.
[c] Measurement made at upper tailrace section.
[d] Measurement made from cable.
[e] Measurement made by wading.
[f] Measurement made from boat.

AUSABLE RIVER AT AUSABLE FORKS, N. Y.

Location.—In village of Ausable Forks, immediately below junction of East and West branches and about 15 miles above mouth of river.

Records available.—August 17, 1910, to December 31, 1913. Data also in annual reports of the New York State Conservation Commission.

Drainage area.—444 square miles [1] (measured on United States Geological Survey topographic sheets).

Gage.—Chain, on the left bank about 100 feet below junction of East and West branches of Ausable River; read daily, morning and evening, to hundredths. Limits of use: Hundredths below 4.5, half-tenths from 4.5 to 5.5, and tenths above 5.5 feet.

Control.—Sand and gravel; likely to shift. Channel divided by an island.

[1] Computed entirely from the topographic sheets, using two which have been newly published; supersedes value previously published.

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Discharge measurements.—Made from cable about 1½ miles below gage. At this place the river flows in one channel.

Winter flow.—Ice may form on riffles below gage and either divert water or cause backwater.

Floods.—Crest of flood of March 25–30 reached gage height 10.2 feet in evening of March 27, as indicated by reading of the gage observer and later verified from high-water marks by engineers of the Geological Survey. Corresponding discharge approximately 25,000 second-feet, or 51 second-feet per squre mile of drainage area.

Accuracy.—Conditions at measuring section good. Rating curve well defined; estimates good.

Discharge measurements of Ausable River at A sable Forks, N. Y., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Feb. 28[a]	C. S. De Golyer	3.67	226
Apr. 21	R. S. Barnes	4.27	950
Sept. 18[b]	G. H. Canfield	3.59	185

[a] Measurement made under complete ice cover. [b] Measurement made by wading.

Daily gage height, in feet, of Ausable River at Ausable Forks, N. Y., for 1913.

[A. S. Baker, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	4.12	3.70	5.05	4.30	4.25	3.65	3.64	.....	3.55	3.88	3.76
2	.....	4.19	3.62	4.46	4.22	4.22	3.69	3.54	.....	3.89	3.78	3.82
3	.....	.....	4.00	4.55	4.20	4.10	3.62	3.50	.....	4.25	3.78	3.86
4	.....	.....	3.76	6.0	4.16	3.97	3.58	3.85	3.55	4.08	3.76	3.94
5	.....	.....	3.62	6.6	4.10	3.94	3.54	3.68	3.54	3.86	3.74	4.15
6	.....	.....	3.68	5.2	4.09	3.94	3.69	3.62	3.54	3.80	3.71	4.24
7	.....	.....	3.92	4.8	4.10	3.95	3.78	3.62	3.46	3.80	3.68	4.27
8	.....	.....	4.09	4.5	4.05	3.97	3.70	3.61	3.60	3.72	3.63	4.35
9	.....	.....	3.64	4.35	3.90	4.00	3.64	3.62	3.55	3.64	3.82	4.15
10	.....	.....	4.24	4.27	3.85	3.98	3.58	3.50	3.58	3.62	5.45	4.10
11	.....	.....	4.18	4.26	3.65	3.96	3.52	3.50	3.52	3.56	4.55	4.25
12	.....	.....	3.99	4.6	3.70	3.92	3.51	3.50	3.55	3.58	4.34	4.06
13	.....	.....	4.24	4.6	3.90	3.80	3.55	3.50	3.51	3.72	4.33	3.98
14	.....	.....	5.5	4.5	3.90	3.71	3.68	3.50	3.58	3.67	4.45	3.86
15	.....	.....	6.4	4.65	3.86	3.68	3.65	3.50	3.64	3.72	4.20	3.82
16	.....	.....	5.5	4.5	3.84	3.83	.....	3.50	3.56	3.71	3.94	3.77
17	.....	.....	4.45	4.35	3.92	3.82	.....	3.41	3.58	3.64	3.88	3.75
18	.....	.....	4.42	4.35	3.90	3.82	.....	3.44	3.58	3.64	3.86	3.72
19	.....	.....	4.32	4.5	3.86	3.80	3.61	3.44	3.56	3.62	3.82	3.66
20	.....	.....	4.20	4.40	3.82	3.80	3.56	3.48	3.58	3.92	4.35	3.66
21	.....	.....	5.25	4.29	3.88	3.75	3.62	3.50	3.49	4.7	4.62	3.68
22	.....	.....	5.9	4.22	4.65	3.69	3.71	3.57	4.15	4.50	4.45	3.68
23	.....	.....	4.5	4.75	4.40	3.66	3.68	3.56	4.22	4.45	4.18	3.75
24	.....	.....	4.7	4.8	3.98	3.66	3.64	3.54	3.92	4.00	4.10	3.68
25	.....	.....	7.1	4.7	3.96	3.66	3.62	3.78	3.82	4.25	4.65	3.74
26	.....	.....	6.8	4.7	4.00	3.64	3.60	3.76	3.70	4.35	4.5	3.68
27	4.35	.....	8.6	4.65	4.01	3.65	3.58	3.73	3.62	4.28	4.30	3.72
28	4.19	3.67	6.9	4.6	5.0	3.86	3.78	3.65	3.55	4.15	3.88	3.82
29	4.37	.....	5.15	4.6	5.2	3.78	4.05	3.58	3.66	4.50	3.81	3.72
30	4.15	.....	4.6	4.55	4.9	3.74	3.95	3.55	3.56	4.05	3.74	3.88
31	3.98	.....	4.6	.....	4.5	.....	3.80	3.55	.....	4.50	.....	3.82

NOTE.—Observations suspended Jan. 1–26, inclusive, and Feb. 3–27. Discharge relation affected by ice Dec. 27–31.

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Daily discharge, in second-feet, of Ausable River at Ausable Forks, N. Y., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	748	273	2,450	1,000	932	234	226	160	160	452	329
2	.....	846	210	1,260	889	889	265	154	160	462	348	388
3	.....	.....	590	1,420	860	720	210	127	160	932	348	431
4	.....	.....	329	5,200	804	555	181	420	160	694	331	520
5	.....	.....	210	7,270	720	520	154	257	154	431	311	790
6	.....	.....	257	2,820	707	520	265	210	154	367	282	918
7	.....	.....	496	1,900	720	532	348	210	107	367	257	962
8	.....	.....	707	1,330	655	555	273	202	194	292	218	1,080
9	.....	.....	226	1,080	473	590	226	210	160	226	388	790
10	.....	.....	918	962	420	567	181	127	181	210	3,500	720
11	.....	.....	832	947	234	543	140	127	140	167	1,420	932
12	.....	.....	578	1,510	273	496	134	127	160	181	1,070	694
13	.....	.....	918	1,510	473	367	160	127	134	292	1,050	506
14	.....	.....	3,640	1,330	473	282	257	127	181	249	1,250	431
15	.....	.....	6,560	1,600	431	257	234	127	226	292	860	388
16	.....	.....	3,640	1,330	409	399	230	127	167	282	520	339
17	.....	.....	1,250	1,080	496	388	220	82	181	226	452	330
18	.....	.....	1,200	1,080	473	388	210	97	181	226	431	292
19	.....	.....	1,040	1,330	431	367	202	97	167	210	388	241
20	.....	.....	860	1,160	388	367	167	117	181	496	1,080	241
21	.....	.....	2,940	990	452	320	210	127	122	1,700	1,550	257
22	.....	.....	4,880	889	1,600	265	282	174	790	1,330	1,250	257
23	.....	.....	1,330	1,800	1,160	241	257	167	889	1,250	832	320
24	.....	.....	1,700	1,900	567	241	226	154	496	590	720	257
25	.....	.....	9,130	1,700	543	241	210	348	388	932	1,600	311
26	.....	.....	8,000	1,700	590	226	194	329	273	1,080	1,330	257
27	1,080	.....	15,000	1,600	603	234	181	301	210	976	1,000	249
28	846	226	8,370	1,510	2,340	431	348	234	160	790	452	339
29	1,120	.....	2,690	1,510	2,820	348	655	181	241	1,330	378	249
30	790	.....	1,510	1,420	2,110	311	532	160	167	655	311	399
31	567	.....	1,510	.....	1,330	.....	367	160	.....	1,330	.....	339

NOTE.—Discharge July 16, 18, and Sept. 1-3 interpolated. Discharge Dec. 27-31 estimated from discharge measurement made Jan. 1, 1914.

Monthly discharge of Ausable River at Ausable Forks, N. Y., for 1913.

[Drainage area, 444 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
March	15,000	210	2,640	5.95	6.86	B.
April	7,270	889	1,790	4.03	4.50	A.
May	2,820	234	821	1.85	2.13	A.
June	932	226	406	.914	1.02	B.
July	655	134	250	.563	.65	B.
August	420	82	182	.410	.47	B.
September	889	107	229	.516	.58	B.
October	1,700	160	604	1.36	1.57	A.
November	3,500	218	813	1.83	2.04	A.
December	1,080	241	469	1.06	1.22	B.

NOTE.—See footnote to table of daily discharge.

LAKE GEORGE.

For the purpose of determining the rate of change and the range in elevation of the water surface of the lake, gages were established on Lake George in July, 1913, at three points—Lake George, Sagamore (Bolton Landing), and Rogers Rock.

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The gage at Lake George was fastened to the concrete wall underneath the east side of the pagoda at Fort William Henry Hotel, near the landing used for motor boats. The observer is G. L. Martin.

At Sagamore the gage was fastened to the south side of the coal dock for Sagamore Hotel, on the west side of Green Island, about 200 feet north of the eastern end of the highway bridge that joins the island and the mainland. The observer is S. G. Finkle.

At Rogers Rock the gage is fastened to a pile in the back end of a covered boat house. The boat house is in a bay on the north side of the steamboat landing. The observer is George O. Cook.

All gages are of the vertical-staff type, made up of standard bronze section graduated to feet, tenths, and half-tenths. The sections are securely fastened to bed planks which in turn are fastened to the piles or concrete support. They were not set to any particular datum, but each gage was referred to a substantial bench mark by the use of an engineer's level. The gages are read once each day to the nearest half-tenth, and the force and direction of the wind are recorded. The results of the observations are presented in the following tables:

Daily gage height, in feet, of Lake George, N. Y., in 1913.

Day.	July.									August.								
	Lake George.			Sagamore.			Rogers Rock.			Lake George.			Sagamore.			Rogers Rock.		
	Gage height in feet.	Wind.		Gage height in feet.	Wind.		Gage height in feet.	Wind.		Gage height in feet.	Wind.		Gage height in feet.	Wind.		Gage height in feet.	Wind.	
		Direction.	Force.[a]		Direction.	Force.[a]		Direction.	Force.[a]		Direction.	Force.[a]		Direction.	Force.[a]		Direction.	Force.[a]
1	.....	.....	.....	.....	.....	.....	.....	.....	.....	4.3	S	H	4.5	S	H	3.05	S	H
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	4.3	.....	.....	4.5	W	L	3.0	S	L
3	.....	.....	.....	.....	.....	.....	.....	.....	.....	4.35	.....	.....	4.45	W	L	3.0	S	M
4	.....	.....	.....	.....	.....	.....	.....	.....	.....	4.4	N	...	4.45	N	L	2.95	N	M
5	.....	.....	.....	.....	.....	.....	.....	.....	.....	4.35	.....	.....	4.45	S	L	2.92	N	L
6	.....	.....	.....	.....	.....	.....	.....	.....	.....	4.35	.....	.....	4.45	Calm.		2.95	S	H
7	.....	.....	.....	.....	.....	.....	.....	.....	.....	4.3	.....	.....	4.45	Calm.		2.8	N	H
8	.....	.....	.....	.....	.....	.....	.....	.....	.....	4.25	.....	.....	4.4	S	H	2.85	S	L
9	.....	.....	.....	4.9	S	H	.....	.....	.....	4.25	.....	.....	4.35	Calm.		2.8	S	M
10	.....	.....	.....	4.9	W	L	3.4	SW	M	4.2	.....	.....	4.35	NE	H	2.85	S	M
11	.....	.....	.....	4.8	N	L	3.4	SW	M	4.2	.....	.....	4.35	NE	H	2.8	N	H
12	.....	.....	.....	4.8	S	L	3.35	S	M	4.2	.....	.....	4.3	Calm.		2.75	Calm.	
13	.....	.....	.....	4.8	Calm.		3.3	S	H	4.1	.....	.....	4.25	Calm.		2.72	S	M
14	.....	.....	.....	4.75	Calm.		3.35	SW	...	4.1	.....	.....	4.2	S	L	2.72	S	L
15	.....	.....	.....	4.75	Calm.		3.3	N	L	4.1	.....	.....	4.15	Calm.		2.7	S	L
16	.....	.....	.....	4.75	NE	H	3.25	N	M	4.1	.....	.....	4.15	Calm.		2.7	S	L
17	.....	.....	.....	4.7	Calm.		3.25	SW	M	4.1	.....	.....	4.1	Calm.		2.65	Calm.	
18	.....	.....	.....	4.7	N	L	3.2	S	M	4.1	.....	.....	4.1	NE	...	2.62	N	H
19	.....	.....	.....	4.7	Calm.		3.2	N	L	4.1	N	H	4.1	NE	...	2.5	N	H
20	.....	.....	.....	4.65	Calm.		3.2	Calm.		4.1	N	H	4.05	NE	...	2.55	N	L
21	.....	.....	.....	4.65	Calm.		3.2	Calm.		3.9	.....	.....	4.05	S	H	2.58	S	M
22	.....	.....	.....	4.65	Calm.		3.18	S	H	3.8	S	H	4.0	S	H	2.55	S	H
23	.....	.....	.....	4.65	S	H	3.2	S	H	3.8	S	H	4.0	SW	L	2.5	S	H
24	4.45	N	...	4.65	Calm.		3.18	S	M	3.8	.....	.....	3.9	SW	L	2.5	S	M
25	4.5	.....	.....	4.6	N	L	3.1	N	L	3.8	.....	.....	3.9	Calm.		2.48	N.	L
26	4.45	.....	.....	4.6	S	L	3.1	S	M	3.8	.....	.....	3.9	S	L	2.5	S	H
27	4.45	.....	.....	4.6	S	L	3.08	S	M	3.8	.....	.....	3.85	N	L	2.48	S	M
28	4.45	.....	.....	4.6	Calm.		3.1	S	M	3.8	.....	.....	3.85	Calm.		2.4	N	L
29	4.45	.....	.....	4.6	Calm.		3.08	S	M	3.75	S	...	3.85	Calm.		2.4	S	M
30	4.5	.....	.....	4.55	Calm.		3.08	N	L	3.75	.....	.....	3.8	Calm.		2.4	S	H
31	4.45	N	H	4.5	Calm.		3.0	N	L	3.7	.....	.....	3.8	Calm.		2.38	S	L

[a] L, light; M, medium; H, heavy.

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Daily gage height, in feet, of Lake George, N. Y., in 1913—Continued.

Day.	September.									October.								
	Lake George.			Sagamore.			Rogers Rock.			Lake George.			Sagamore.			Rogers Rock.		
	Gage height in feet.	Wind.		Gage height in feet.	Wind.		Gage height in feet.	Wind.		Gage height in feet.	Wind.		Gage height in feet.	Wind.		Gage height in feet.	Wind.	
		Direction.	Force.		Direction.	Force.		Direction.	Force.		Direction.	Force.		Direction.	Force.		Direction.	Force.
1	3.75	....	...	3.8	Calm.		2.35	Calm.		3.35	N	...	3.45	Calm.		1.9	S	M
2	3.7	....	...	3.8	S	L	2.35	S	M	3.35	N	...	3.5	Calm.		1.9	N	H
3	3.7	....	...	3.8	NE	H	2.35	S	H	3.35	N	...	3.5	NE	L	2.0	N	M
4	3.65	....	...	3.75	NE	L	2.3	N	H	3.35	N	...	3.5	NE	H	1.9	N	H
5	3.65	....	...	3.75	NE	L	2.2	N	M	3.3	S	...	3.5	NE	L	1.95	Calm.	
6	3.6	....	...	3.75	NE	L	2.2	N	L	3.3	S	...	3.45	Calm.		1.98	SW	H
7	3.6	....	...	3.7	Calm.		2.25	S	M	3.25	S	...	3.45	S	L	1.95	S	L
8	3.55	....	...	3.7	NE	H	2.25	N	L	3.25	N	...	3.4	Calm.		1.92	SW	L
9	3.55	....	...	3.7	NE	H	2.0	N	H	3.25	N	...	3.4	Calm.		1.92	Calm.	
10	3.5	....	...	3.65	NE	H	2.1	N	M	3.25	N	...	3.4	Calm.		1.92	S	M
11	3.5	....	...	3.6	Calm.		2.1	Calm.		3.25	N	...	3.4	S	H	1.9	SW	M
12	3.45	....	...	3.6	W	H	2.1	N	L	3.25	S	...	3.35	N	L	1.9	SW	L
13	3.45	....	...	3.55	W	H	2.08	S	L	3.25	S	...	3.35	NE	H	1.9	N	L
14	3.4	....	...	3.55	NE	H	2.05	N	H	3.25	NE	...	3.35	NE	H	1.85	N	H
15	3.35	....	...	3.5	NE	H	2.0	N	M	3.25	NE	...	3.3	NE	H	1.9	N	M
16	3.3	....	...	3.5	S	L	2.02	S	M	3.25	NE	...	3.3	NE	H	1.8	N	H
17	3.3	....	...	3.5	S	L	2.0	S	M	3.25	NE	...	3.3	NE	H	1.8	N	M
18	3.3	....	...	3.45	NE	...	2.0	S	...	3.25	NE	...	3.3	NE	H	1.8	S	M
19	3.25	....	...	3.45	S	L	1.98	N	L	3.2	S	...	3.3	NE	H	1.7	N	H
20	3.25	....	...	3.45	S	L	1.95	Calm.		3.15	S	...	3.35	S	H	1.9	S	L
21	3.25	S	...	3.4	S	H	1.92	S	L	3.15	S	...	3.4	S	H	2.1	S	H
22	3.35	S	...	3.55	S	L	2.1	S	M	3.15	N	...	3.4	S	H	1.88	SE	...
23	3.35	N	...	3.55	S	L	2.1	N	L	3.15	SE	...	3.4	S	H	1.98	S	H
24	3.35	N	...	3.55	Calm.		2.08	Calm.		3.15	S	...	3.45	S	H	1.88	S	L
25	3.35	W	...	3.5	S	H	2.08	S	H	3.15	S	...	3.5	S	H	1.9	Calm.	
26	3.35	S	...	3.5	Calm.		2.05	S	M	3.2	N	...	3.55	NE	H	1.95	N	L
27	3.35	N	H	3.5	W	H	2.0	SW	M	3.2	N	...	3.6	S	L	2.05	Calm.	
28	3.35	N	...	3.5	W	H	2.02	SE	H	3.2	N	...	3.6	S	L	2.1	S	M
29	3.35	N	...	3.5	S	L	2.0	S	H	3.2	N	...	3.6	S	L	2.1	S	M
30	3.35	S	...	3.45	NE	L	1.9	N	H	3.2	N	...	3.55	Calm.		2.05	N	M
31	.....	....	...	.....	.....		.....	.....	...	3.2	N	...	3.55	N	L	2.1	SW	H

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Daily gage height, in feet, of Lake George, N. Y., in 1913—Continued.

Day.	November.									December.								
	Lake George.			Sagamore.			Rogers Rock.			Lake George.			Sagamore.			Rogers Rock.		
	Gage height in feet.	Wind.		Gage height in feet.	Wind.		Gage height in feet.	Wind.		Gage height in feet.	Wind.		Gage height in feet.	Wind.		Gage height in feet.	Wind.	
		Direction.	Force.		Direction.	Force.		Direction.	Force.		Direction.	Force.		Direction.	Force.		Direction.	Force.
1	3.2	SW	...	3.5	NW	M	2.08	SW	H	3.15	S	...	3.3	S	L	1.82	S	M
2	3.2	S	...	3.5	S	L	2.0	N	M	3.15	S	...	3.25	Calm.		1.8	Calm.	
3	3.2	N	...	3.5	N	L	2.0	S	M	3.15	N	...	3.25	W	L	1.8	N	M
4	3.2	S	...	3.45	N	L	2.05	SW	H	3.15	N	...	3.25	N	L	1.78	Calm.	
5	3.2	NW	...	3.45	Calm.		2.0	SE	L	3.1	NE	...	3.2	Calm.		1.7	N	M
6	3.2	N	...	3.45	S	L	1.98	S	H	3.1	W	...	3.2	NE	L	1.75	S	M
7	3.2	SE	...	3.4	S	L	1.95	S	L	3.1	S	...	3.2	S	M	1.78	S	L
8	3.2	S	...	3.4	S	L	1.92	S	L	3.1	S	...	3.2	Calm.		1.9	S	H
9	3.2	S	...	3.4	S	H	1.9	NE	L	3.1	SE	...	3.25	S	M	1.95	S	M
10	3.2	S	...	3.4	S	H	2.1	S	H	3.1	S	...	3.25	S	M	1.95	S	H
11	3.25	NE	...	3.4	S	H	2.02	S	H	3.1	N	...	3.3	Calm.		1.85	N	H
12	3.25	N	...	3.4	S	H	2.0	S	L	3.1	N	...	3.3	Calm.		1.95	S	M
13	3.25	W	...	3.4	S	M	2.0	S	M	3.1	W	...	3.3	Calm.		1.85	Calm.	
14	3.25	N	...	3.4	W	L	1.98	Calm.		3.1	S	...	3.3	NE	M	1.9	S	M
15	3.25	N	...	3.4	S	L	1.9	NW	L	3.1	S	...	3.3	Calm.		1.85	S	H
16	3.25	N	...	3.4	N	L	1.9	N	M	3.1	N	...	3.3	S	H	1.8	N	L
17	3.25	S	...	3.35	S	H	1.9	Calm.		3.1	N	...	3.25	S	H	1.85	S	H
18	3.2	S	...	3.35	S	L	1.9	S	H	3.1	SW	...	3.25	S	L	1.8	Calm.	
19	3.2	S	...	3.35	S	H	1.88	S	L	3.1	S	...	3.25	S	L	1.8	S	M
20	3.2	S	...	3.35	Calm.		1.9	S	M	3.1	S	...	3.25	S	L	1.78	S	M
21	3.2	W	...	3.35	Calm.		1.85	Calm.		3.1	SW	...	3.25	Calm.		1.75	Calm.	
22	3.2	S	...	3.35	S	H	1.8	S	M	3.1	NE	...	3.25	N	L	1.7	N	H
23	3.2	SW	...	3.35	SW	H	1.85	SW	H	3.1	N	...	3.25	Calm.		1.75	Calm.	
24	3.2	W	...	3.35	N	L	1.85	S	H	3.1	N	...	3.3	Calm.		1.75	N	L
25	3.2	N	...	3.3	S	L	1.85	SW	M	3.1	N	...	3.3	NE	L	1.78	N	L
26	3.2	N	...	3.3	NE	H	1.8	N	H	3.1	N	...	3.3	NE	H	1.9	N	H
27	3.2	N	...	3.3	N	L	1.8	N	M	3.1	N	...	3.3	Calm.		1.9	N	M
28	3.15	N	...	3.3	Calm.		1.8	SW	L	3.1	S	...	3.3	S	L	1.9	N	L
29	3.15	S	...	3.3	N	L	1.78	N	M	3.1	S	...	3.3	S	L	1.85	NE	M
30	3.15	S	...	3.3	Calm.		1.8	S	M	3.1	N	...	3.3	W	M	1.8	S	M
31	.....	.....	...	.....	.....	...	.....	.....	...	3.1	N	...	3.3	NE	M	1.8	S	M

EAST CREEK NEAR RUTLAND, VT.

Location.—At Lester Bridge, on road from Rutland to Brandon, Vt., about 3 miles north of Rutland, 2½ miles below the union of the two branches that drain Blue Ridge Mountain, and 3½ miles above confluence with Otter River.

Records available.—August 9, 1911, to December 31, 1913.

Drainage area.—47 square miles.

Gage.—Vertical staff fastened to the left-hand downstream side of the bridge; read daily, morning and evening, to quarter-tenths. All gage heights used to quarter-tenths.

Control.—Probably permanent.

Discharge measurements.—Made from the bridge or by wading.

Regulation.—Flow regulated by two dams near headwaters and one dam about a mile below station. The upper dams store considerable water. Discharge relation is not affected by backwater from dam below.

Winter flow.—Discharge relation affected by ice.

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Floods.—Flood of March, 1913, reached gage height about 8.3, as determined from high-water marks by an engineer of the Geological Survey. Observer's records indicate that this extreme stage occurred about midnight on March 26.

Accuracy.—Discharge rating curve not complete. Artificial regulation of this stream makes mean daily gage height computed from semidaily observations doubtful.

Discharge measurements of East Creek near Rutland, Vt., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Mar. 24	R. S. Barnes	4.24	144
May 2	....do	4.09	115
Sept. 17[a]	G. H. Canfield	4.16	118
Nov. 1[a]	C. S. DeGolyer	4.18	118

[a] Measurement made by wading.

Gage height, in feet, of East Creek near Rutland, Vt., for 1913.

[M. Lester, observer.]

Day.	January.				February.				March.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.
1	6.20	3.8	5.40	3.5	6.20	3.95	6.00	3.72	6.30	3.45	5.40	3.8
2	6.15	3.5	5.50	3.98	6.15	3.7	5.30	3.9	6.30	3.4	5.40	3.4
3	6.10	3.7	5.45	4.5	6.20	3.92	5.40	3.85	6.30	3.8	5.50	3.82
4	6.15	4.0	5.40	3.95	6.30	3.7	5.50	3.72	6.30	3.4	5.45	3.7
5	6.15	3.7	5.40	3.5	6.25	3.7	5.45	3.7	6.30	3.45	6.00	3.55
6	6.20	3.65	5.50	4.05	6.20	3.68	5.40	3.82	6.20	3.4	5.50	3.6
7	6.20	4.5	5.40	4.3	6.20	3.95	5.40	5.65	6.20	3.8	5.45	3.6
8	6.30	4.15	5.45	4.25	6.30	3.6	5.30	3.6	6.30	3.8	5.40	3.72
9	6.20	3.9	5.40	3.9	6.30	3.45	5.30	3.4	6.30	3.5	5.30	3.4
10	6.15	3.85	5.50	4.15	.....	.....	.....	.....	6.20	3.72	6.00	4.2
11	6.20	4.0	5.30	4.1	.....	.....	.....	.....	6.15	3.7	6.10	3.85
12	6.20	4.15	6.15	4.0	.....	.....	.....	.....	6.30	3.5	6.15	4.1
13	6.20	3.88	5.40	3.85	.....	.....	.....	.....	6.20	3.65	6.15	3.75
14	6.15	3.7	5.50	4.1	.....	.....	.....	.....	6.20	4.2	5.45	4.9
15	6.20	3.85	5.40	4.0	.....	.....	.....	.....	6.20	4.65	6.00	4.75
16	6.15	3.95	5.45	4.1	.....	.....	.....	.....	6.30	4.4	6.15	4.0
17	6.20	4.3	5.40	4.5	.....	.....	.....	.....	6.30	3.75	6.00	3.92
18	6.20	4.5	5.30	4.72	.....	.....	.....	.....	6.20	3.7	6.10	3.9
19	6.15	4.4	5.30	4.25	.....	.....	.....	.....	6.35	3.65	6.00	3.95
20	6.20	4.1	5.40	4.3	.....	.....	5.40	3.8	6.15	3.7	6.20	4.4
21	6.15	4.68	5.50	4.6	6.20	3.92	5.45	3.9	6.20	4.4	6.00	4.55
22	6.15	4.45	5.45	4.45	6.30	3.75	5.40	4.6	6.15	4.62	5.40	4.1
23	6.10	4.3	5.40	4.4	6.30	4.3	5.40	3.62	6.30	3.78	5.40	4.0
24	6.20	4.6	5.45	4.3	6.20	3.7	5.50	3.6	6.15	4.25	5.40	4.2
25	6.30	4.15	5.35	4.22	6.30	3.65	5.45	3.65	6.20	4.45	5.45	6.38
26	6.20	3.15	5.30	4.08	6.20	3.6	5.50	3.7	6.20	5.92	5.50	6.42
27	6.15	4.0	5.40	4.15	6.30	3.45	5.50	3.75	6.30	6.2	7.00	6.6
28	6.20	4.1	5.45	4.0	6.30	3.4	5.45	3.68	6.20	6.25	6.00	5.35
29	6.20	3.92	5.50	3.95	.....	.....	.....	.....	6.30	5.2	5.35	5.2
30	6.15	3.8	5.45	3.9	.....	.....	.....	.....	6.25	5.2	5.55	4.95
31	6.20	3.8	5.40	3.85	.....	.....	.....	.....	6.30	4.78	6.00	4.95

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Gage height, in feet, of East Creek near Rutland, Vt., for 1913—Continued.

Day.	April.				May.				June.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.
1	5.40	4.6	6.10	4.65	6.00	3.9	6.00	3.98	5.45	3.7	5.40	3.75
2	5.30	4.4	6.00	4.6	5.50	3.6	6.10	3.9	5.50	3.98	5.40	3.9
3	5.40	4.3	6.00	4.4	5.45	3.7	6.20	3.92	5.45	3.9	5.30	3.8
4	6.00	4.35	6.10	4.4	6.10	3.6	5.40	3.32	5.40	3.9	5.00	3.92
5	6.00	4.38	5.50	4.45	6.00	3.4	5.45	3.6	5.45	3.88	5.50	3.9
6	5.50	4.25	5.45	4.2	5.50	3.6	6.00	3.5	5.50	3.6	6.00	3.78
7	6.00	4.2	6.00	4.38	6.00	3.42	6.10	3.62	5.40	3.5	5.40	3.85
8	5.50	4.02	6.00	4.15	6.00	3.4	5.45	3.6	6.00	3.58	5.45	3.5
9	6.00	3.95	6.10	4.2	6.10	3.42	5.50	3.72	5.40	3.42	5.50	3.7
10	5.50	3.55	6.00	3.95	6.00	3.4	6.00	3.7	5.40	3.4	6.00	3.68
11	6.00	3.5	6.10	3.8	6.15	3.45	5.40	3.62	5.45	3.45	6.00	4.0
12	6.10	3.75	5.40	3.9	6.00	3.4	6.00	3.88	5.30	3.38	5.40	3.9
13	6.00	3.82	5.35	3.8	6.00	3.35	5.50	3.6	5.30	3.3	6.00	3.85
14	5.50	3.85	5.50	3.78	6.10	3.4	6.15	3.92	5.40	3.3	6.00	3.85
15	6.00	3.8	6.20	3.8	6.15	3.35	5.50	3.9	5.40	3.5	6.00	3.5
16	6.00	3.7	5.40	3.75	6.10	3.42	6.00	3.65	5.35	4.0	3.00	3.98
17	6.10	3.62	5.50	4.02	6.10	3.42	6.00	3.65	5.10	3.55	6.00	4.0
18	5.50	3.6	6.10	3.95	6.00	3.3	5.45	3.9	5.15	3.5	5.45	3.85
19	5.50	3.6	6.20	3.88	6.00	3.55	5.50	3.85	5.30	3.28	5.50	3.8
20	6.00	3.6	5.40	3.72	5.45	3.52	5.45	3.75	5.30	3.25	6.00	3.98
21	6.00	3.5	6.00	3.9	5.50	3.3	6.00	3.7	5.30	3.3	5.45	3.85
22	5.45	3.52	6.10	3.7	6.00	3.45	6.10	4.2	5.40	3.45	7.10	3.6
23	5.50	3.6	6.15	3.7	6.00	4.4	5.45	4.45	5.40	3.5	6.00	3.88
24	5.45	3.62	6.20	3.88	6.00	4.48	5.40	4.4	5.30	3.5	5.50	3.9
25	5.50	3.6	5.50	3.8	6.15	4.08	5.40	4.0	5.20	3.4	5.50	3.95
26	5.50	3.65	5.45	3.6	6.10	3.9	6.00	3.88	5.30	3.5	5.45	3.88
27	5.50	3.65	5.40	3.52	6.00	3.9	6.10	3.8	5.30	3.5	7.30	3.6
28	5.50	3.5	5.40	3.6	6.00	3.78	6.00	4.3	5.35	3.55	5.40	3.82
29	5.50	3.92	6.00	4.0	5.50	4.5	5.50	4.42	5.40	3.9	5.50	3.65
30	6.00	3.62	5.50	4.02	5.50	4.2	5.45	4.1	5.35	3.42	5.50	3.4
31					5.50	4.0	5.50	3.8				

Day.	July.				August.				September.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.
1	5.50	3.4	5.40	3.95	5.30	3.9	5.50	4.1	5.30	4.12	5.50	4.15
2	6.00	3.45	6.00	3.98	5.35	3.5	6.00	3.9	5.40	3.72	6.00	3.85
3	6.00	3.4	5.50	3.9	5.40	3.52	5.40	3.9	5.40	3.5	7.30	4.1
4	6.00	3.55	5.40	3.8	5.35	4.15	6.00	4.1	5.50	3.5	6.15	4.08
5	5.30	3.5	5.40	3.88	5.30	3.98	6.00	3.9	5.40	3.98	6.00	4.1
6	6.00	3.55	5.40	3.7	5.35	4.0	6.10	3.88	6.00	3.55	6.10	4.1
7	5.40	3.48	6.00	4.18	5.30	4.0	5.50	4.1	5.50	3.52	6.00	3.8
8	5.35	3.98	6.00	4.2	5.35	4.0	6.00	4.0	5.45	3.6	5.50	4.15
9	5.30	3.55	5.30	4.0	5.30	3.5	5.40	3.8	5.40	4.1	6.00	4.2
10	5.40	4.12	6.00	4.1	5.45	3.4	5.40	3.8	5.50	4.15	6.00	4.15
11	5.50	4.15	6.00	3.98	5.40	4.1	5.50	4.0	5.40	3.6	6.15	4.15
12	5.50	3.6	6.00	3.9	5.35	4.15	5.45	4.0	5.30	4.15	6.20	4.1
13	5.30	3.9	5.40	3.6	5.30	4.1	5.50	4.18	5.40	3.55	6.15	4.15
14	5.45	3.65	6.10	4.0	5.45	4.0	5.40	4.1	5.50	3.45	5.50	3.8
15	5.30	4.0	6.00	4.0	5.40	3.98	5.50	4.0	5.35	3.6	6.15	4.0
16	5.30	4.08	6.15	3.85	5.45	3.5	5.45	4.0	5.30	3.6	6.20	4.1
17	5.35	4.0	6.00	4.0	5.50	3.38	5.45	3.75	5.40	3.6	6.10	4.12
18	5.30	3.6	6.00	4.0	5.40	3.40	5.50	4.0	5.50	3.65	6.20	4.0
19	5.40	3.7	6.10	4.0	5.40	4.12	6.00	4.15	5.45	3.5	6.10	4.0
20	5.40	3.5	5.40	3.68	5.50	4.1	6.00	4.2	5.40	3.5	6.00	4.0
21	5.45	4.05	6.00	4.0	5.50	4.05	5.50	3.85	5.50	3.48	5.40	3.78
22	5.30	4.08	6.00	3.98	5.30	3.6	5.00	3.98	5.50	3.78	5.50	4.5
23	5.40	4.05	6.30	4.0	7.30	3.85	5.00	3.9	5.45	4.2	6.00	4.15
24	5.45	4.1	4.50	4.2	5.40	3.42	5.40	3.75	5.50	3.6	5.00	4.1
25	5.40	4.1	6.00	4.1	7.20	3.8	4.50	4.0	5.50	3.65	6.00	4.15
26	5.30	3.6	5.50	3.95	7.30	3.9	4.55	4.0	5.45	3.62	6.10	4.2
27	5.40	3.6	5.40	3.8	7.20	4.0	4.50	4.4	5.50	3.58	5.40	4.1
28	5.30	3.98	6.00	4.2	7.40	4.2	4.35	4.2	6.00	3.4	5.40	3.8
29	5.40	3.75	6.00	3.9	7.35	4.2	5.50	3.92	5.50	3.5	6.10	3.9
30	5.40	3.7	5.50	4.2	7.40	4.0	5.50	3.8	2.45	3.55	6.00	4.18
31	5.30	3.5	6.00	4.18	5.40	3.32	5.40	3.82				

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Gage height, in feet, of East Creek near Rutland, Vt., for 1913—Continued.

Day.	October.				November.				December.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.
1	5.40	3.5	6.00	3.95	5.50	3.62	5.50	4.0	6.20	3.7	5.50	4.2
2	5.45	3.5	5.45	4.2	6.00	3.65	5.40	3.8	6.30	3.45	5.45	4.25
3	5.50	3.8	5.50	4.2	5.50	3.4	6.00	4.0	6.25	3.6	5.40	4.3
4	5.45	3.8	6.00	4.0	6.00	3.6	6.00	4.15	6.30	3.68	5.50	4.2
5	5.50	3.6	5.40	3.88	6.10	3.4	5.45	4.0	6.35	3.55	6.00	4.2
6	5.45	3.6	6.00	4.2	6.00	3.5	6.00	4.2	6.30	3.4	5.45	4.18
7	5.50	3.7	6.10	4.15	6.10	3.6	6.00	4.25	6.35	3.48	5.40	4.0
8	5.45	3.6	5.50	4.1	5.50	3.65	5.50	4.0	6.40	3.7	5.50	4.15
9	6.00	3.7	5.40	4.15	6.10	3.5	5.40	4.4	6.30	3.75	5.45	4.2
10	5.50	3.65	6.00	4.2	6.00	4.2	6.00	4.3	6.35	3.7	5.40	4.25
11	6.00	3.62	6.00	4.2	5.50	3.9	6.00	4.2	6.30	3.72	5.50	4.2
12	6.10	3.4	6.00	3.9	6.00	3.78	5.50	4.0	6.35	3.8	5.45	4.2
13	6.00	3.65	6.00	4.3	5.50	3.72	6.00	4.0	6.30	3.7	5.40	4.12
14	6.10	3.8	5.50	4.2	5.50	3.65	6.00	4.1	6.30	3.4	5.00	3.82
15	6.20	3.8	6.00	4.18	6.00	3.6	5.40	3.92	6.20	3.6	6.30	3.7
16	6.15	3.78	6.00	4.25	6.00	3.58	5.40	4.0	6.40	3.48	5.50	3.72
17	6.00	3.7	6.00	4.3	5.50	3.5	5.50	4.25	6.40	3.4	5.50	4.2
18	6.10	3.7	5.40	4.3	5.45	3.55	6.00	4.3	6.45	3.6	6.00	4.18
19	6.00	3.7	5.45	3.98	6.00	3.5	5.50	4.28	6.40	3.5	6.00	4.2
20	6.15	3.7	5.50	4.4	5.50	3.8	5.45	4.3	6.50	3.55	5.50	4.15
21	6.10	4.1	6.00	4.25	6.00	3.68	5.50	4.25	6.40	3.55	5.40	3.98
22	6.00	3.9	6.00	4.32	6.00	3.65	5.40	4.3	6.40	3.5	6.00	4.15
23	6.15	3.85	5.50	4.3	6.00	3.5	5.40	3.98	6.50	3.5	5.45	4.2
24	5.50	3.8	6.00	4.3	6.00	3.55	5.50	4.3	6.40	3.45	5.40	4.2
25	5.50	3.78	6.00	4.7	5.45	3.62	6.00	4.2	6.30	3.6	5.40	3.95
26	6.00	4.2	5.45	4.3	6.00	3.58	6.00	4.3	6.35	3.9	5.45	4.1
27	6.00	4.15	6.00	4.3	6.15	3.4	5.45	4.0	.....	.....	.....	.....
28	5.50	4.0	5.50	4.2	6.30	3.4	6.00	3.95	.....	.....	.....	.....
29	5.45	3.8	6.00	4.15	6.25	3.6	6.00	4.2	.....	.....	.....	.....
30	5.50	3.7	5.45	4.1	6.30	3.48	5.40	3.92	.....	.....	.....	.....
31	5.50	3.7	5.45	4.1	.....	.....	.....	.....	.....	.....	.....	.....

LAKE CHAMPLAIN AT BURLINGTON, VT.

Location.—On south side of roadway leading to dock of Champlain Transportation Co., at foot of King Street, Burlington, Vt.

Records available.—May, 1907, to December 31, 1913.

Gage.—Staff; read once daily. Comparisons of gage readings indicate that zero of gage at Burlington is at practically the same elevation as that of gage at Fort Montgomery—92.50 feet above mean sea level.

Cooperation.—Gage heights furnished through the courtesy of Mr. D. A. Loomis, general manager of the Champlain Transportation Co.

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Daily gage height, in feet, of Lake Champlain at Burlington, Vt., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	4.35	.....	7.80	5.62	.....	2.52	1.48	0.83	0.50	0.80	1.05
2	3.00	.....	.....	7.85	5.59	3.37	2.43	1.48	.72	.50	.....	1.05
3	3.10	4.28	.....	7.90	5.55	3.82	2.40	.....	.70	.55	.80	1.08
4	3.12	4.20	.....	8.00	.....	3.82	2.38	1.43	.70	.....	.80	1.10
5	.....	.....	.....	8.10	5.35	3.80	2.38	1.40	.68	.60	.78	1.10
6	3.25	.....	.....	.....	5.25	3.80	.....	1.38	.65	.63	.78	1.15
7	3.25	4.00	.....	8.20	5.08	3.80	2.35	1.28	.....	.65	.80	.....
8	3.20	3.95	.....	8.10	4.98	.....	2.32	1.28	.65	.65	.80	1.15
9	3.20	.....	.....	8.05	4.85	3.78	2.32	1.23	.60	.65	.....	1.18
10	3.20	3.90	.....	7.90	4.72	3.65	2.28	.....	.60	.63	.80	1.20
11	3.20	.....	.....	7.70	.....	3.58	2.25	1.23	.58	.62	.82	1.20
12	.....	.....	.....	7.65	4.54	3.54	2.22	1.20	.55	.....	.82	1.20
13	3.33	.....	.....	.....	4.48	3.52	.....	1.20	.50	.60	.85	1.20
14	3.40	.....	.....	7.52	4.43	3.47	2.20	1.18	.....	.60	.85	.....
15	3.40	.....	3.50	7.40	4.38	.....	2.10	1.15	.50	.60	.85	1.20
16	3.42	.....	.....	7.20	4.26	3.39	2.07	1.11	.50	.62	.....	1.20
17	3.50	.....	4.10	7.20	4.20	3.18	2.04	.....	.50	.62	.87	1.22
18	3.60	.....	4.15	7.13	.....	3.10	1.98	1.09	.50	.63	.87	1.22
19	.....	.....	4.25	7.00	4.00	3.02	1.90	1.28	.50	.....	.90	1.25
20	4.10	.....	4.40	.....	3.88	2.95	.....	1.23	.50	.65	.90	1.25
21	4.25	.....	4.45	6.80	3.88	2.90	1.82	1.22	.....	.65	.92	.....
22	4.35	.....	4.63	6.70	3.83	.....	1.80	1.18	.50	.65	.92	1.25
23	4.40	.....	.....	6.52	3.78	2.86	1.70	1.10	.50	.65	.....	1.28
24	4.60	.....	4.85	6.48	3.75	2.75	1.70	.....	.50	.65	.92	1.30
25	.....	.....	5.15	6.38	.....	2.75	1.65	1.08	.50	.65	.....	.....
26	.....	.....	5.65	6.28	3.72	2.75	1.62	1.05	.50	.....	.95	1.30
27	.....	.....	6.48	.....	3.72	2.75	.....	1.00	.50	.70	.95	1.30
28	.....	.....	7.20	6.05	3.75	2.68	1.60	1.00	.....	.75	.98	.....
29	4.60	.....	7.56	5.95	3.85	.....	1.54	.98	.50	.80	1.00	1.32
30	4.50	.....	.....	5.78	.....	2.56	1.54	.90	.50	.80	.....	1.32
31	4.40	.....	7.64	.....	3.90	.....	1.52	.....	.....	.80	.....	1.32

NOTE.—The lake was frozen during portions of February and March. The thickest ice recorded was 15½ inches, on March 10.

WINOOSKI RIVER ABOVE STEVENS BRANCH, NEAR MONTPELIER, VT.

Location.—At plant of Corry-Deavitt & Frost Co., 3 miles above Montpelier, Vt., and above the several large tributaries that enter in the vicinity of Montpelier.

Records available.—May 18, 1909, to November 15, 1913.

Drainage area.—Not measured.

Gage.—Staff, bolted to a bowlder on right bank about 100 feet below the power plant.

Control.—Shifting.

Discharge measurements.—Made from lower railroad bridge, about half a mile below gage.

Regulation.—As power plant is operated on 24-hour schedule, daily fluctuations in stage of river are usually not great.

Winter flow.—Discharge relation considerably affected by anchor ice.

Accuracy.—Owing to shifts of channel, a complete discharge rating curve has not been developed. Mean daily gage height, computed from semidaily observations, should be used with caution because of artificial control during low water.

The following discharge measurement was made by G. H. Canfield:

September 16, 1913: Gage height, 2.56; discharge, 88 second-feet.

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Gage height, in feet, of Winooski River above Stevens Branch, near Montpelier, Vt., for 1913.

[P. J. Burke, observer.]

Day.	January.				February.				March.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.
1	8.35	3.55	.....	.....	7.00	3.9	1.00	3.9	.....	.....	.....	.....
2	.....	.....	3.00	3.2	8.00	3.7	.....	.....	.....	.....	.....	.....
3	.....	.....	5.00	3.0	10.00	3.0	.....	.....	.....	.....	.....	.....
4	7.00	4.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5	10.00	3.5	1.00	3.5	.....	.....	.....	.....	.....	.....	.....	.....
6	.....	.....	5.00	3.4	.....	.....	.....	.....	.....	.....	.....	.....
7	7.00	3.7	4.00	3.7	.....	.....	.....	.....	.....	.....	.....	.....
8	10.00	3.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
9	10.00	3.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
10	9.00	3.6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
11	9.00	3.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
12	8.00	3.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
17	10.00	3.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
18	7.00	4.5	5.00	4.4	.....	.....	.....	.....	.....	.....	.....	.....
19	8.00	4.8	4.00	5.0	.....	.....	.....	.....	.....	.....	.....	.....
20	9.00	4.0	.....	.....	.....	.....	.....	.....	11.00	2.4	2.00	2.5
21	.....	.....	2.00	4.5	.....	.....	.....	.....	7.00	3.2	3.00	2.9
22	8.00	4.2	2.30	4.0	.....	.....	.....	.....	7.00	4.3	5.00	3.1
23	9.00	3.7	.....	.....	.....	.....	.....	.....	10.00	2.1	.....	.....
24	7.00	3.6	.....	.....	.....	.....	.....	.....	.....	.....	3.00	1.9
25	.....	.....	.....	.....	.....	.....	.....	.....	9.00	2.6	2.00	3.8
26	8.00	3.4	4.00	3.35	.....	.....	.....	.....	7.00	4.0	2.00	4.2
27	8.00	3.7	1.00	3.7	.....	.....	.....	.....	8.00	3.9	2.30	4.5
28	.....	.....	12.00	3.0	.....	.....	.....	.....	8.00	4.0	4.00	3.3
29	7.30	3.2	3.30	2.8	.....	.....	.....	.....	10.30	2.6	.....	.....
30	11.00	3.35	.....	.....	.....	.....	.....	.....	5.00	2.5	4.00	2.3
31	.....	.....	.....	.....	.....	.....	.....	.....	8.00	2.2	2.00	2.2

Day.	April.				May.				June.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.
1	7.00	2.5	6.00	2.5	7.00	1.25	.....	.....	10.00	1.4	.....	.....
2	.....	.....	.....	.....	7.00	1.25	.....	.....	7.00	1.4	.....	.....
3	9.00	1.9	.....	.....	.....	.....	4.00	1.2	.....	.....	4.00	1.3
4	.....	.....	.....	.....	8.00	1.0	.....	.....	7.00	1.3	4.00	1.3
5	7.00	2.6	5.00	3.0	7.00	.9	.....	.....	7.00	1.2	4.00	1.2
6	8.00	2.4	5.00	2.4	.....	.....	.....	.....	8.00	1.2	.....	.....
7	7.00	2.3	1.00	2.3	7.00	.95	12.10	.8	8.00	1.3	4.00	1.2
8	10.00	1.9	2.00	1.8	7.00	.9	.....	.....	9.00	1.0	3.00	.95
9	8.00	1.8	4.00	1.8	7.30	1.0	2.00	.9	8.00	1.2	1.00	1.0
10	11.00	1.7	5.00	1.6	.....	.....	.....	.....	.....	.....	.....	.....
11	7.00	1.6	6.00	1.6	7.00	.8	5.00	.8	.....	.....	4.00	1.2
12	8.00	1.9	.....	.....	.....	.....	4.00	1.0	6.30	.8	4.00	1.2
13	9.00	1.8	4.00	1.8	7.00	1.0	4.00	1.0	7.00	.9	4.00	1.2
14	7.00	1.8	.....	.....	7.00	1.0	6.00	.9	7.00	.8	4.00	1.2
15	8.00	1.75	4.00	1.75	7.00	1.0	6.00	.9	8.00	.8	6.00	.95
16	8.00	1.7	2.00	1.7	6.30	1.0	6.00	.8	8.00	.8	5.00	.8
17	8.00	1.65	4.00	1.6	7.00	1.0	6.00	1.0	11.00	1.0	4.00	1.0
18	8.00	1.6	4.00	1.6	9.00	.9	4.00	.9	11.00	1.0	.....	.....
19	8.00	1.8	5.00	1.75	.....	.....	3.00	1.0	7.00	1.0	.....	.....
20	8.00	1.8	4.00	1.8	8.00	1.0	4.00	1.0	6.30	.5	.....	.....
21	9.00	1.6	4.00	1.55	7.00	1.0	4.00	1.0	7.00	.5	.....	.....
22	8.00	1.5	3.00	1.45	7.00	1.0	4.00	1.0	9.00	.5	.....	.....
23	7.00	1.45	1.00	1.45	.....	.....	.....	.....	8.00	.8	.....	.....
24	7.00	1.4	2.00	1.4	7.00	2.3	4.00	2.2	8.00	.8	5.00	.0
25	7.00	1.4	6.00	1.4	8.00	1.8	.....	.....	8.00	.8	5.00	.0
26	10.00	1.35	2.00	1.35	7.00	1.6	3.00	1.5	8.00	.8	2.00	.8
27	11.00	1.3	.....	.....	8.00	1.3	2.00	1.3	8.00	.8	5.00	.0
28	7.00	1.3	.....	.....	7.00	1.4	.....	.....	8.00	.8	1.00	.8
29	8.00	1.3	5.00	1.3	7.00	2.7	.....	.....	8.00	.7	5.00	.8
30	11.00	1.3	.....	.....	8.00	2.3	1.00	2.0	8.00	.8	5.00	.0
31	.....	.....	.....	.....	8.00	1.7	4.00	1.6	.....	.....	.....	.....

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Gage height, in feet, of Winooski River above Stevens Branch, near Montpelier, Vt., for 1913—Continued.

Day.	July.				August.				September.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.
1	6.30	0.0			10.00	1.0						
2	7.00	.7									5.00	0.0
3	8.00	.7	4.00	0.5					8.00	0.9	5.00	.0
4	8.00	.7			8.00	.9	5.00	0.0	8.00	.9	5.00	.0
5	11.00	.0	3.00	0.5	8.00	.7	4.00	.0	8.00	.9	5.00	.0
6	8.00	.6	6.00	.7	8.00	.7	4.00	.0	8.00	.9	4.00	.0
7	10.00	.9	5.00	.0	8.00	.7	4.00	.0				
8	8.00	.9	5.00	.0	8.00	.7						
9	8.00	.9	5.00	.0	8.00	.7	4.00	.3				
10	8.00	.9	5.00	.0	8.00	.0	6.00	.0				
11	8.00	.9			8.00	.7	4.00	.0				
12					8.00	.7						
13	8.00	.7	5.00	.0	8.00	.7	5.00	.0				
14	8.00	.7	5.00	.0	8.00	.7	5.00	.0				
15	8.00	.7	5.00	.0	8.00	.7	5.00	.0				
16					8.00	.7	5.00	.0				
17	8.00	.7	5.00	.0	8.00	.0	6.30	.0				
18	8.00	.7	5.00	.0	9.00	.4	5.00	.0				
19	7.00	.9	5.00	.7	9.00	.7	5.00	.0				
20	8.00	.7	5.00	.7	8.00	.7	5.00	.0			5.00	.0
21	9.00	.7	5.00	.0	8.00	.7	5.00	.0	10.00	.0	1.00	.0
22	7.00	.9	5.00	.0	8.00	.7	5.00	.0	8.00	.5	5.00	.0
23	7.00	.9	5.00	.7	9.00	.6	8.00	.3			2.30	1.1
24	8.00	1.0	5.00	.7			2.00	.0	8.00	.5	5.00	.0
25	8.00	.7	5.00	.0	8.00	.7	4.00	.0	8.00	.9	2.00	.5
26	8.00	.7	5.00	.7	8.00	.7	5.00	.0	8.00	.5	4.00	.5
27	8.00	.9	5.00	.8	8.00	.7	5.00	.0	8.00	.5	4.00	.0
28	8.00	.7			8.00	.7	5.00	.0	9.00	.5	4.00	.3
29	10.00	1.8			8.00	.8	5.00	.0	8.00	.6	4.00	.0
30	8.00	1.8							8.00	.6	5.00	.0
31	8.00	1.4										

Day.	October.				November.			
	A. M.		P. M.		A. M.		P. M.	
	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.	Time.	Gage height.
1	9.00	0.5	5.00	0.0				
2	9.00	.5						
3	9.00	.5			9.00	0.9		
4	9.00	.5	5.00	.3				
5					11.00	1.0		
6	9.00	.5	5.30	.1				
7	9.00	.5	5.00	.0	9.00	.9		
8	9.00	.5	5.00	.0				
9	9.00	.5	5.00	.0				
10	9.00	.5	5.00	.0				
11	9.00	.5	5.00	.0			4.00	1.0
12			4.00	.4				
13	9.00	1.0						
14	7.00	.9	4.00	.2				
15	7.00	.6			7.00	1.0		
16	9.00	.5						
17	9.00	.5						
18	9.00	.5						
19	9.00	.6	5.00	.3				
20	9.00	.5						
21	7.00	1.6						
22			5.00	.75				
23			5.00	.55				
24			5.00	.6				
25	8.00	.9						
26								
27	9.00	1.4						
28	9.00	1.1						
29	10.00	1.0						
30								
31								

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WINOOSKI RIVER AT MONTPELIER, VT.

Location.—At covered wooden highway bridge near Central Vermont Railway station in Montpelier, just above mouth of Dog River and just below mouth of Worcester Branch of Winooski River.

Records available.—May 19, 1909, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Chain, attached to the highway bridge; read daily, morning and evening, to half-tenths. Limits of use: Half-tenths below and tenths above 5.5 feet.

Control.—Probably permanent.

Discharge measurements.—Formerly made from a footbridge about half a mile below the highway bridge at high stages and by wading at low stages. Recent high-water measurements made from the highway bridge.

Regulation.—The operation of the plant of the Colton Manufacturing Co. causes decided diurnal fluctuation in discharge at low stages. Fluctuations in the discharge of Worcester Branch are also apparent at this station.

Winter flow.—Discharge relation sometimes affected by ice.

Floods.—Flood of March, 1913, reached a maximum stage of 14.6 as determined with a level by an engineer of the Survey. Corresponding discharge approximately 15,500 second-feet.

Accuracy.—Rating curve well defined. Accuracy of estimates depends on the accuracy of mean daily gage heights.

Discharge measurements of Winooski River at Montpelier, Vt., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Mar. 8[a]	C. S. De Golyer	4.33	203	Apr. 26	R. S. Barnes	5.40	395
25	R. S. Barnes	8.41	4,140	Sept. 15[b]	G. H. Canfield	3.87	93
26	do	9.54	5,850	16[b]	do	3.97	105

[a] Measurement made under complete ice cover.

[b] Measurement made by wading.

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Gage height, in feet, and discharge, in second-feet, of Winooski River at Montpelier, Vt., for 1913.

[Raymond Colton, observer.]

Day.	January.				February.				March.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	4.85	563	4.8	535	5.45	945	5.5	980	.....	.....	.....	.....
2	4.85	563	4.85	563	4.75	508	4.55	406	4.3	289	4.2	246
3	4.75	508	4.75	508	4.85	563	4.95	620	4.3	289	4.3	289
4	4.85	563	5.25	808	4.85	563	4.9	590	4.4	334	4.4	334
5	6.2	1,560	6.2	1,560	4.8	535	4.7	480	4.3	289	4.3	289
6	5.8	1,210	5.8	1,210	4.5	381	4.5	381	4.4	334	4.5	381
7	5.6	1,060	5.5	980	4.5	381	4.55	406	4.3	289	4.3	289
8	5.45	945	5.35	875	4.4	334	4.3	289	4.3	289	4.4	334
9	5.25	808	4.85	563	4.3	289	4.5	381	4.45	358	4.9	590
10	4.85	563	4.85	563	4.5	381	4.5	381	5.7	1,130	5.8	1210
11	4.85	563	5.15	742	.....	.....	.....	.....	5.2	775	5.2	775
12	5.35	875	5.45	945	.....	.....	.....	.....	5.1	710	5.15	742
13	5.15	742	5.2	775	.....	.....	.....	.....	5.1	710	5.1	710
14	4.85	563	4.85	563	.....	.....	.....	.....	10.0	.....	11.2	.....
15	4.85	563	4.95	620	.....	.....	.....	.....	10.7	6,540	10.0	5700
16	4.85	563	4.85	563	.....	.....	.....	.....	9.1	4,620	9.0	4500
17	4.85	563	4.85	563	.....	.....	.....	.....	8.3	3,680	8.3	3680
18	5.15	742	5.6	1,060	.....	.....	.....	.....	5.6	960	5.5	890
19	7.8	3,400	7.6	3,140	.....	.....	.....	.....	5.5	890	5.3	755
20	6.0	1,380	5.8	1,210	.....	.....	.....	.....	5.4	820	5.4	820
21	7.8	3,400	8.4	4,180	.....	.....	.....	.....	8.6	4,020	8.8	4260
22	6.8	2,190	5.45	945	.....	.....	.....	.....	10.0	5,700	10.0	5700
23	5.6	1,060	5.45	945	.....	.....	.....	.....	6.4	1,660	6.5	1760
24	5.6	1,060	5.6	1,060	.....	.....	.....	.....	6.5	1,760	6.5	1760
25	5.25	808	5.35	875	.....	.....	.....	.....	8.5	3,900	12.0	8100
26	5.15	742	5.15	742	.....	.....	.....	.....	9.7	5,340	12.2	8340
27	5.6	1,060	5.6	1,060	.....	.....	.....	.....	10.5	6,300	13.0	9300
28	5.35	875	5.45	945	.....	.....	.....	.....	8.1	3,460	6.9	2160
29	5.35	875	5.35	875	.....	.....	.....	.....	6.6	1,860	6.5	1760
30	5.25	808	5.35	875	.....	.....	.....	.....	6.4	1,660	6.5	1760
31	5.25	808	5.15	742	.....	.....	.....	.....	6.5	1,760	6.5	1760

Day.	April.				May.				June.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	6.0	1,300	6.1	1,390	4.55	348	4.55	348	5.3	755	4.9	505
2	5.6	960	5.5	890	4.45	309	4.45	309	5.4	820	5.2	660
3	5.5	890	5.35	788	4.45	309	4.45	309	4.9	505	4.9	505
4	5.4	820	5.5	890	4.35	272	4.4	290	4.95	535	4.9	505
5	5.6	960	5.5	890	4.45	309	4.45	309	4.8	455	4.75	432
6	6.0	1,300	6.3	1,570	4.45	309	4.45	309	4.6	368	4.6	368
7	6.0	1,300	6.0	1,300	4.4	290	4.35	272	4.9	505	5.0	565
8	6.1	1,390	6.4	1,660	4.35	272	4.45	309	4.6	368	4.5	328
9	6.4	1,660	6.8	2,060	4.45	309	4.45	309	4.4	290	4.5	328
10	6.4	1,660	6.1	1,390	4.35	272	4.35	272	4.5	328	4.5	328
11	6.0	1,300	6.0	1,300	4.3	254	4.3	254	4.5	328	4.5	328
12	6.0	1,300	6.0	1,300	4.35	272	4.45	309	4.4	290	4.3	254
13	6.0	1,300	6.0	1,300	4.45	309	4.45	309	4.4	290	4.4	290
14	6.0	1,300	6.0	1,300	4.45	309	4.45	309	4.5	328	4.45	309
15	6.0	1,300	6.0	1,300	4.35	272	4.4	290	4.4	290	4.4	290
16	6.0	1,300	6.0	1,300	4.4	290	4.4	290	4.4	290	4.4	290
17	5.8	1,120	5.8	1,120	4.45	309	4.45	309	4.0	160	4.5	328
18	5.45	855	5.45	855	4.4	290	4.35	272	4.5	328	4.45	309
19	5.45	855	5.5	890	4.35	272	4.35	272	4.5	328	4.5	328
20	5.35	788	5.45	855	4.35	272	4.45	309	4.3	254	4.3	254
21	5.35	788	5.35	788	4.45	309	4.75	309	4.2	220	4.3	254
22	5.35	788	5.35	788	4.85	480	5.05	595	4.1	189	4.1	189
23	5.2	690	5.25	722	5.8	1,120	6.4	1,660	3.9	133	3.95	146
24	5.15	658	5.15	658	6.7	1,960	6.8	2,060	3.9	133	3.9	133
25	4.95	535	5.05	595	6.9	2,160	7.3	2,580	4.0	160	3.9	133
26	4.95	535	4.95	535	7.3	2,580	7.2	2,470	4.1	189	4.15	204
27	4.95	535	5.0	565	6.8	2,060	6.9	2,160	4.2	220	4.3	254
28	4.95	535	4.95	535	6.9	2,160	7.0	2,260	3.7	87	3.7	87
29	5.0	565	4.95	535	6.9	2,160	6.6	1,860	3.7	87	3.7	87
30	4.95	535	4.85	480	6.3	1,570	6.2	1,480	3.8	109	3.85	121
31	.....	.....	.....	.....	5.7	1,040	5.5	890	.....	.....	.....	.....

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Gage height, in feet, and discharge, in second-feet, of Winooski River at Montpelier, Vt., for 1913—Continued.

Day.	July.				August.				September.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	3.9	133	3.9	133	3.85	121	3.95	146	4.0	160	4.05	174
2	3.9	133	3.9	133	4.35	272	4.15	204	4.0	160	3.9	133
3	3.8	109	3.85	121	4.15	204	4.25	237	3.8	109	3.75	98
4	3.9	133	3.8	109	4.15	204	4.15	204	3.6	68	3.7	87
5	3.8	109	3.75	98	4.15	204	4.2	220	3.7	87	4.0	160
6	3.65	78	3.65	78	4.15	204	4.15	204	3.9	133	3.8	109
7	3.7	87	3.65	78	4.05	174	4.05	174	3.8	109	3.85	121
8	3.65	78	3.65	78	3.85	121	3.95	146	4.0	160	3.8	109
9	3.7	87	3.65	78	3.95	146	4.0	160	3.9	133	3.8	109
10	3.85	121	4.15	204	4.15	204	4.0	160	3.85	121	3.9	133
11	4.05	174	4.1	189	3.95	146	4.0	160	3.8	109	3.9	133
12	4.1	189	4.1	189	4.05	174	4.05	174	3.85	121	3.9	133
13	3.95	146	3.95	146	4.05	174	4.05	174	3.9	133	3.9	133
14	3.9	133	3.95	146	3.95	146	4.0	160	3.8	109	3.85	121
15	4.05	174	4.05	174	4.0	160	4.05	174	3.7	87	3.5	51
16	3.85	121	3.95	146	4.05	174	4.05	174	3.45	44	3.25	20
17	3.85	121	3.85	121	3.95	146	4.0	160	3.65	78	3.75	98
18	3.85	121	3.95	146	4.05	174	4.15	204	3.9	133	4.05	174
19	4.05	174	3.85	121	4.1	189	4.1	189	3.8	109	3.75	98
20	3.75	98	3.65	78	4.05	174	4.1	189	3.95	146	4.0	160
21	3.85	121	3.95	146	4.0	160	.....	.....	3.95	146	3.95	146
22	3.95	146	3.85	121	3.75	98	3.8	109	3.9	133	4.1	189
23	3.85	121	3.65	78	4.2	220	4.4	290	4.6	368	4.5	328
24	3.85	121	3.85	121	4.8	455	4.95	535	4.4	290	4.2	220
25	3.75	98	3.85	121	5.3	755	5.2	690	4.1	189	3.95	146
26	3.85	121	3.9	133	4.7	410	4.9	505	3.9	133	4.05	174
27	3.85	121	3.85	121	5.1	625	4.8	455	3.95	146	3.9	133
28	4.05	174	4.65	389	4.3	254	4.1	189	3.8	109	3.5	51
29	4.25	237	4.0	160	4.0	160	4.1	189	3.3	25	3.4	37
30	4.15	204	3.85	121	4.1	189	4.1	189	3.6	68	3.7	87
31	3.65	78	3.85	121	4.0	160	4.1	189	.....	.....	.....	.....

Day.	October.				November.				December.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	3.8	109	3.85	121	4.4	290	4.3	254	4.35	272	4.45	309
2	3.9	133	4.0	160	4.1	189	4.0	160	4.35	272	4.35	272
3	3.4	37	3.3	25	4.3	254	4.4	290	4.35	272	4.4	290
4	4.1	189	4.2	220	4.2	220	4.3	254	4.45	309	4.55	348
5	4.0	160	3.9	133	4.3	254	4.35	272	4.5	328	4.45	309
6	3.6	68	3.7	87	4.3	254	4.3	254	4.35	272	4.25	237
7	3.7	87	3.65	78	4.3	254	4.2	220	4.15	204	4.25	237
8	3.7	87	3.8	109	4.15	204	4.3	254	4.65	389	5.05	595
9	3.8	109	3.9	133	4.2	220	4.3	254	4.75	432	4.6	368
10	3.85	121	4.0	160	4.3	254	4.3	254	4.45	309	4.45	309
11	4.0	160	4.0	160	4.15	204	4.05	174	4.4	290	4.45	309
12	3.95	146	4.0	160	4.05	174	4.1	189	4.45	309	4.45	309
13	4.0	160	4.0	160	4.15	204	4.15	174	4.45	309	4.45	309
14	4.3	254	4.4	290	4.25	237	4.45	309	4.4	290	4.45	309
15	4.3	254	4.3	254	4.75	432	4.35	272	4.45	309	4.4	290
16	4.2	220	4.3	254	4.15	204	4.05	174	4.35	272	4.35	272
17	4.1	189	4.0	160	4.15	204	4.25	237	4.25	237	4.3	254
18	3.8	109	3.9	133	4.25	237	4.25	237	4.25	237	4.4	290
19	3.5	51	3.6	68	4.35	272	4.55	348	4.35	272	4.45	309
20	4.3	254	4.4	290	5.05	595	5.6	960	4.35	272	4.35	272
21	5.0	565	5.2	690	5.15	688	4.75	432	4.15	204	4.0	160
22	4.75	432	4.7	410	4.55	348	4.45	309	4.45	309	4.55	348
23	4.8	455	4.9	505	4.15	204	4.25	237	4.35	272	4.3	254
24	4.9	505	5.0	565	4.35	272	4.45	309	4.25	237	4.35	272
25	5.0	565	5.05	595	4.35	272	4.4	290	4.25	237	4.25	237
26	5.1	625	5.1	625	4.25	237	4.25	237	4.25	237	4.3	254
27	5.0	565	5.1	625	4.1	189	4.05	174	4.45	309	4.55	348
28	4.8	455	4.7	410	4.05	174	4.25	237	4.55	348	4.6	368
29	4.6	368	4.65	389	4.25	237	4.35	272	4.45	309	4.45	309
30	4.6	368	4.55	348	4.15	204	4.05	174	4.55	348	4.55	348
31	4.4	290	4.5	328	.....	.....	.....	.....	.....	.....	.....	.....

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WORCESTER BRANCH OF WINOOSKI RIVER AT MONTPELIER, VT.

Location.—A short distance below plant of Lane Manufacturing Co., at Montpelier, near junction of Worcester Branch with main stream.

Records available.—May 15, 1909, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Vertical staff, fastened to a stone wall and tree about 100 feet below power plant; read daily, morning and evening, to half-tenths. Limits of use: Half-tenths below and tenths above 3.0 feet.

Control.—Fairly permanent.

Discharge measurements.—Made from steel highway bridge about 300 feet below gage.

Regulation.—Flow affected by operation of power plant just above station.

Winter flow.—Discharge relation materially affected by ice.

Floods.—Flood of March, 1913, reached a maximum stage of 9.8 feet at 4.30 p. m. March 25, and a second peak stage of 9.7 feet at 4.30 p. m. March 27. Records of maximum stage verified by engineer of Geological Survey from high-water marks. Maximum discharge approximately 3,420 second-feet.

Accuracy.—Rating curve fairly well defined. Accuracy of estimates depends on the accuracy of mean daily gage heights.

Discharge measurements of Worcester Branch of Winooski River at Montpelier, Vt., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.ft.*
Mar. 26	R. S. Barnes	7.20	2,030
26	....do	6.50	1,700
Apr. 28	....do	1.87	126

Gage height, in feet, and discharge, in second-feet, of Worcester Branch of Winooski River at Montpelier, Vt., for 1913.

[S. A. Luke, observer.]

Day.	January.				February.				March.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	1.4	54	1.35	48	2.0	145	1.8	110	.....	.....	.....	.....
2	1.35	48	1.3	43	.....	.....	a1.5	66	.....	.....	.....	.....
3	1.3	43	1.8	110	1.5	66	1.5	66	.....	.....	.....	.....
4	3.0	390	2.5	258	1.4	54	1.5	66	.....	.....	.....	.....
5	.....	.....	a2.1	165	1.5	66	1.5	66	.....	.....	.....	.....
6	1.7	94	1.8	110	1.6	79	1.5	66	.....	.....	.....	.....
7	2.1	165	2.0	145	1.55	72	1.5	66	.....	.....	.....	.....
8	1.8	110	1.9	127	1.4	54	1.4	54	.....	.....	.....	.....
9	2.0	145	1.6	79	.....	.....	a1.5	.....	.....	.....	.....	.....
10	1.7	94	1.6	79	1.6	.....	1.7	.....	.....	.....	.....	.....
11	1.7	94	1.6	79	1.6	.....	1.8	.....	.....	.....	.....	.....
12	.....	.....	a2.6	283	1.7	.....	1.8	.....	.....	.....	.....	.....
13	2.3	210	2.4	234	1.7	.....	1.7	.....	.....	.....	.....	.....
14	2.2	187	2.1	165	1.8	.....	1.9	.....	.....	.....	.....	.....
15	1.9	127	1.8	110	2.2	.....	2.3	.....	.....	.....	.....	.....
16	1.6	79	1.7	94	.....	.....	a2.4	.....	.....	.....	.....	.....
17	1.6	79	2.05	155	.....	.....	.....	.....	2.9	362	2.7	309
18	2.9	362	3.1	418	.....	.....	.....	.....	2.3	210	2.4	234
19	a5.0	1,070	a3.9	666	.....	.....	.....	.....	2.9	362	3.3	476
20	3.0	390	2.6	283	.....	.....	.....	.....	3.6	568	4.1	734
21	4.7	954	4.1	734	.....	.....	.....	.....	4.4	842	5.8	1,400
22	3.0	390	2.7	309	.....	.....	.....	.....	6.3	1,620	4.2	770
23	2.2	187	2.2	187	.....	.....	.....	.....	.....	.....	a3.0	390
24	2.3	210	2.2	187	.....	.....	.....	.....	2.8	335	3.3	476
25	1.9	127	2.0	145	.....	.....	.....	.....	5.1	1,110	9.8	3,420
26	.....	.....	a1.9	127	.....	.....	.....	.....	5.2	1,150	6.6	1,760
27	2.0	145	2.0	145	.....	.....	.....	.....	5.4	1,230	9.7	3,360
28	1.7	94	1.7	94	.....	.....	.....	.....	5.2	1,150	3.8	632
29	1.7	94	1.5	66	.....	.....	.....	.....	3.6	568	3.0	390
30	1.6	79	1.5	66	.....	.....	.....	.....	.....	.....	a2.6	283
31	1.5	66	1.5	66	.....	.....	.....	.....	2.7	309	4.6	916

a On Sunday usually one gage reading between 2 and 5 p. m.

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Gage height, in feet, and discharge, in second-feet, of Worcester Branch of Winooski River at Montpelier, Vt., for 1913—Continued.

Day.	April.				May.				June.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	3.9	666	3.3	476	1.4	54	1.5	66	.....	.....	a 1.8	110
2	2.7	309	2.7	309	1.4	54	1.5	66	1.9	127	1.7	94
3	2.4	234	2.4	234	1.3	43	1.4	54	1.6	79	1.6	79
4	3.0	390	3.7	600	.....	.....	a 1.2	32	1.5	66	1.6	79
5	4.8	992	4.5	878	1.25	38	1.3	43	1.4	54	1.5	66
6	.....	.....	a 2.9	362	1.1	22	1.4	54	1.3	43	1.45	60
7	2.5	258	2.6	283	1.2	32	1.05	18	1.3	43	1.5	66
8	2.2	187	2.5	258	1.1	22	1.05	18	.....	.....	a 1.4	54
9	2.2	187	2.3	210	1.2	32	1.4	54	1.3	43	1.5	66
10	2.0	145	2.2	187	1.2	32	1.4	54	1.2	32	1.3	43
11	2.4	234	2.7	309	.....	.....	a 1.0	14	1.2	32	1.4	54
12	2.5	258	2.7	309	1.1	22	1.4	54	1.15	27	1.3	43
13	.....	.....	a 2.7	309	1.1	22	1.4	54	1.2	32	1.4	54
14	2.6	283	2.4	234	1.1	22	1.4	54	1.15	27	1.4	54
15	2.7	309	2.35	222	1.15	27	1.3	43	.....	.....	a 1.1	22
16	2.6	283	2.4	234	1.2	32	1.3	43	1.1	22	1.4	54
17	2.4	234	2.2	187	1.2	32	1.3	43	1.25	38	1.5	66
18	1.9	127	2.0	145	.....	.....	a 1.2	32	1.2	32	1.3	43
19	2.2	187	3.1	418	1.25	38	1.3	43	1.1	22	1.2	32
20	.....	.....	a 2.4	234	1.15	27	1.4	54	1.1	22	1.2	32
21	2.1	165	2.2	187	1.1	22	1.4	54	1.0	14	1.15	27
22	2.0	145	1.9	127	1.2	32	1.9	127	.....	.....	a 1.0	14
23	1.9	127	2.0	145	2.4	234	2.6	283	1.0	14	1.1	22
24	2.0	145	1.9	127	3.0	390	2.8	335	1.0	14	1.1	22
25	1.9	127	1.9	127	.....	.....	a 2.4	234	1.0	14	1.2	32
26	1.8	110	1.8	110	1.8	110	1.8	110	.8	2.5	1.3	43
27	.....	.....	a 1.65	86	1.6	79	1.6	79	1.0	14	1.1	22
28	1.6	79	1.7	94	1.9	127	2.2	187	1.0	14	1.1	22
29	1.6	79	1.6	79	4.6	916	4.4	842	.....	.....	a .9	7.5
30	1.4	54	1.6	79	2.6	283	2.4	234	.9	7.5	1.0	14
31	.....	.....	.....	.....	2.2	187	2.1	165	.....	.....	.....	.....

Day.	July.				August.				September.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	1.0	14	1.1	22	0.9	7.5	1.1	22	0.8	2.5	0.8	2.5
2	1.0	14	1.05	18	.9	7.5	.8	2.5	.9	7.5	1.0	14
3	.8	2.5	.8	2.5	.....	.....	a .9	7.5	.9	7.5	1.0	14
4	.....	.....	.8	2.5	.8	2.5	.7	.5	.8	2.5	.9	7.5
5	.8	2.5	.8	2.5	.8	2.5	1.2	32	.8	2.5	.9	7.5
6	.....	.....	a .9	7.5	.8	2.5	.9	7.5	.8	2.5	.9	7.5
7	.9	7.5	1.1	22	.8	2.5	.8	2.5	.....	.....	a .9	7.5
8	.9	7.5	.8	2.5	.7	.5	.8	2.5	.8	2.5	.9	7.5
9	.8	2.5	.8	2.5	.7	.5	.8	2.5	.8	2.5	.8	2.5
10	.8	2.5	1.1	22	.....	.....	a .8	2.5	.8	2.5	.8	2.5
11	1.05	18	1.1	22	.8	2.5	.8	2.5	.8	2.5	.8	2.5
12	.9	7.5	1.1	22	.7	.5	.8	2.5	.8	2.5	.8	2.5
13	.....	.....	a .9	7.5	.7	.5	.7	.5	.8	2.5	1.0	14
14	1.05	18	1.1	22	.6	.0	.8	2.5	.....	.....	a .9	7.5
15	1.1	22	1.1	22	.7	.5	.8	2.5	.9	7.5	.9	7.5
16	.9	7.5	1.05	18	.7	.5	.8	2.5	.9	7.5	.85	5.0
17	.9	7.5	1.1	22	.....	.....	a .7	.5	.8	2.5	.85	5.0
18	.8	2.5	1.0	14	.7	.5	.8	2.5	.8	2.5	.8	2.5
19	1.4	54	1.1	22	.8	2.5	1.0	14	.8	2.5	.8	2.5
20	.....	.....	a .9	7.5	.9	7.5	.9	7.5	.8	2.5	.8	2.5
21	.8	2.5	.9	7.5	.8	2.5	.8	2.5	.....	.....	a .8	2.5
22	.9	7.5	.9	7.5	.8	2.5	.8	2.5	.8	2.5	1.1	22
23	.9	7.5	.9	7.5	.9	7.5	.8	2.5	.9	7.5	1.5	66
24	.8	2.5	.8	2.5	.....	.....	a .8	2.5	.9	7.5	1.35	48
25	.8	2.5	.8	2.5	.8	2.5	1.0	14	.9	7.5	1.2	32
26	1.05	18	1.3	43	.8	2.5	.9	7.5	.8	2.5	.95	11
27	.....	.....	a 1.0	14	.8	2.5	1.0	14	.9	7.5	.9	7.5
28	1.0	14	1.3	43	.8	2.5	1.0	14	.....	.....	a .8	2.5
29	1.3	43	1.5	66	.8	2.5	1.0	14	.8	2.5	1.0	14
30	1.15	27	1.4	54	.9	7.5	1.0	14	.85	5.0	1.0	14
31	1.0	14	.9	7.5	.....	.....	a .8	2.5	.....	.....	.....	.....

a On Sunday one gage reading between 2 and 5 p. m.

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Gage height, in feet, and discharge, in second-feet, of Worcester Branch of Winooski River at Montpelier, Vt., for 1913—Continued.

Day.	October.				November.				December.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	0.8	25	1.1	22	1.2	32	1.4	54	1.1	22	1.5	66
2	.8	25	.8	25	.....	.....	a 1.1	22	1.3	43	1.6	79
3	.8	25	.9	7.5	1.2	32	1.2	32	1.5	66	1.9	127
4	.8	25	.9	7.5	1.1	22	1.4	54	1.7	94	1.7	94
5	.....	.....	a.9	7.5	1.1	22	1.3	43	1.6	79	1.6	79
6	1.0	14	1.1	22	1.1	22	1.25	38	1.4	54	1.5	66
7	.8	25	1.1	22	1.1	22	1.2	32	.....	.....	a 1.3	43
8	.8	25	1.0	14	1.1	22	1.25	38	2.2	187	2.3	210
9	.8	25	1.0	14	1.1	22	1.3	43	1.7	94	1.75	102
10	.8	25	1.0	14	1.8	110	1.9	127	1.4	54	1.7	94
11	.8	25	.9	7.5	1.3	43	1.5	66	1.35	48	1.6	79
12	.....	.....	a.9	7.5	1.3	43	1.5	66	1.3	43	1.5	66
13	1.1	22	1.2	32	1.2	32	1.5	66	1.3	43	1.55	72
14	1.1	22	1.4	54	1.15	27	1.4	54	.....	.....	a 1.4	54
15	1.15	27	1.25	38	1.1	22	1.4	54	1.4	54	1.5	66
16	1.0	14	1.1	22	1.1	22	1.1	22	1.3	43	1.5	66
17	1.0	14	1.2	32	1.1	22	1.3	43	1.2	32	1.3	43
18	.9	7.5	1.0	14	1.1	22	1.2	32	1.2	32	1.5	66
19	.....	.....	a.8	2.5	1.1	22	1.25	38	1.3	43	1.5	66
20	1.4	54	1.45	60	3.1	418	2.8	335	1.2	32	1.5	66
21	2.0	145	1.5	66	2.3	210	2.0	145	.....	.....	a 1.2	32
22	1.6	79	1.8	110	1.7	94	1.7	94	1.2	32	1.35	48
23	1.4	54	1.8	110	1.55	72	1.5	66	1.3	43	1.4	54
24	1.2	32	1.4	54	1.4	54	1.6	79	1.1	22	1.35	48
25	1.2	32	2.6	283	1.3	43	1.5	66	1.15	27	1.2	32
26	2.1	165	2.3	210	1.3	43	1.4	54	1.2	32	1.3	43
27	2.5	258	2.2	187	1.0	14	1.0	14	1.1	22	1.3	43
28	1.7	94	1.6	79	1.0	14	1.4	54	.....	.....	a 1.2	32
29	1.3	43	1.5	66	1.05	18	1.4	54	1.2	32	1.5	66
30	1.3	43	1.5	66	.....	.....	a 1.0	14	1.2	32	1.4	54
31	1.2	32	1.45	60	.....	.....	.....	.....	1.3	43	1.5	66

a On Sunday usually one gage reading between 2 and 5 p. m.

NOTE.—Discharge relation affected by ice about Feb. 9 to Mar. 16.

DOG RIVER AT NORTHFIELD, VT.

Location.—At highway bridge in Northfield, Vt., near Norwich University grounds. Union Brook flows into Dog River a short distance below station.

Records available.—May 14, 1909, to December 31, 1913. August 23, 1910, station at lower bridge; August 23, 1910, to December 31, 1913, present station.

Drainage area.—57 square miles.

Gage.—Vertical staff attached to highway bridge; read daily, morning and evening, to quarter-tenths. Limits of use: Hundredths below 2.0, half-tenths from 2.0 to 3.0, and tenths above 3.0.

Control.—Probably permanent.

Discharge measurements.—Made from highway bridge during high water and by wading during low water.

Regulation.—Diurnal fluctuation caused by operations of power plant probably not sufficient to affect materially computations based on semidaily observations of gage height.

Floods.—Flood of March, 1913, reached a maximum stage 8.5 feet at approximately 10 p. m. March 25. A second maximum of 7.7 feet was reached at noon March 27 Maximum discharge was about 3,400 second-feet, or 60 second-feet per square mile of drainage area.

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Discharge measurements of Dog River at Northfield, Vt., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Mar. 27	R. S. Barnes	7.50	2,520
27	do	7.00	1,960
Apr. 28	do	1.93	90
Sept. 14[a]	G. H. Canfield	0.70	3.66

[a] Measurement made by wading.

Daily gage height, in feet, of Dog River at Northfield, Vt., for 1913.

[Florence C. Doyle, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.62	2.0	1.10	2.85	1.90	2.0	0.96	0.85	0.70	0.80	1.55	1.60
2	1.55	1.35	1.20	2.6	1.84	1.90	.92	.85	.68	1.25	1.50	1.70
3	2.25	1.40	1.05	2.4	1.80	1.85	.96	.81	.72	1.22	1.41	1.95
4	2.25	1.48	1.10	3.4	1.71	1.95	.90	.89	.80	1.05	1.35	1.85
5	1.80	1.48	1.10	4.0	1.76	1.82	.95	.90	.72	.94	1.48	1.75
6	1.28	1.32	1.02	3.3	1.65	1.73	.90	.92	.69	.80	1.40	1.65
7	2.2	1.35	1.05	2.85	1.55	1.70	.90	.82	.69	.74	1.40	1.68
8	1.20	1.30	.....	2.6	1.55	1.64	1.05	.80	.70	.75	1.45	2.15
9	1.30	.....	.....	2.35	1.60	1.60	1.18	.79	.68	.85	2.15	2.3
10	1.35	.....	3.0	2.6	1.52	1.50	1.25	.78	.62	.90	2.6	1.90
11	1.45	.....	1.80	2.6	1.51	1.35	1.12	.78	.62	.80	2.05	1.78
12	3.4	.....	2.15	2.5	1.48	1.20	.96	.75	.72	1.15	1.78	1.78
13	1.95	.....	1.68	2.45	1.44	1.35	1.05	.75	.70	1.25	1.80	1.72
14	1.80	.....	6.2	2.5	1.51	1.34	1.00	.82	.70	1.25	1.72	1.76
15	1.80	.....	4.7	2.5	1.42	1.20	.95	.78	.70	1.18	1.68	1.75
16	1.75	.....	3.1	2.25	1.60	1.32	.90	.78	.70	1.05	1.65	1.65
17	2.65	.....	1.60	2.3	1.55	1.35	.88	.75	.72	1.00	1.65	1.68
18	3.1	.....	1.90	2.25	1.5	1.42	.84	.85	.72	.88	1.59	1.65
19	2.9	.....	3.1	2.55	1.49	1.35	.88	.80	.70	.99	1.70	1.55
20	2.4	.....	3.9	2.30	1.41	1.28	.85	.70	.75	1.98	2.4	1.56
21	4.0	1.65	3.4	2.2	1.39	1.22	.86	.70	.70	2.0	1.95	1.58
22	2.45	2.1	2.4	2.2	1.85	1.19	.82	.80	1.50	1.78	1.82	1.52
23	2.1	1.68	2.6	2.3	2.3	1.22	.82	.85	1.25	1.35	1.81	1.30
24	2.45	1.30	3.8	2.3	2.6	1.18	.88	.72	.86	1.29	1.78	1.42
25	2.0	1.22	5.2	2.2	2.1	1.08	.92	.70	.80	1.82	1.68	1.50
26	1.92	1.05	4.4	2.15	2.0	1.02	1.00	.69	.74	2.4	1.61	1.52
27	2.1	1.10	7.1	2.1	1.89	1.12	.79	.90	.78	2.45	1.55	1.60
28	1.75	1.08	3.7	2.1	2.1	1.02	1.29	.80	.78	1.88	1.65	1.62
29	1.45	.....	3.1	2.0	3.2	1.00	1.20	.80	.69	1.85	1.60	1.50
30	1.70	.....	2.95	1.94	2.45	1.00	1.00	.78	.68	1.81	1.55	1.40
31	1.62	.....	4.0	.....	2.2	.....	.92	.74	.....	1.68	.....	1.40

NOTE.—Discharge relation affected by ice about Feb. 9-20.

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Daily discharge, in second-feet, of Dog River at Northfield, Vt., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	59	99	18	215	88	99	10	7	4	5	52	57
2	52	35	24	177	81	88	9	7	4	28	48	67
3	130	39	15	149	77	82	10	6	4	26	40	94
4	130	46	18	312	68	94	8	8	5	15	35	82
5	77	46	18	443	73	79	10	8	4	10	46	72
6	30	33	13	293	62	70	8	9	4	5	39	62
7	123	35	15	215	52	67	8	6	4	4	39	65
8	24	31	15	177	52	61	15	5	4	4	44	117
9	31	.....	50	142	57	57	23	5	4	7	117	136
10	35	.....	239	177	50	48	28	5	3	8	177	88
11	44	.....	77	177	49	35	19	5	3	5	105	75
12	312	.....	117	163	46	24	10	4	4	21	75	75
13	94	.....	65	156	43	35	15	4	4	28	77	69
14	77	.....	1,290	163	49	34	12	6	4	28	69	73
15	77	.....	647	163	41	24	10	5	4	23	65	72
16	72	.....	256	130	57	33	8	5	4	15	62	62
17	184	.....	57	136	52	35	8	4	4	12	62	65
18	256	.....	88	130	48	41	6	7	4	8	56	62
19	223	.....	256	170	47	35	8	5	4	12	67	52
20	149	.....	419	136	40	30	7	4	4	97	149	53
21	443	62	312	123	38	25	7	4	4	99	94	55
22	156	111	149	123	53	28	6	5	48	75	79	50
23	111	65	177	136	136	26	6	7	28	35	78	31
24	156	31	306	136	177	23	8	4	7	30	75	41
25	99	25	838	123	111	17	9	4	5	79	65	48
26	90	15	553	117	99	13	12	4	4	149	58	50
27	111	18	2,100	111	87	19	5	8	5	156	52	57
28	72	17	374	111	111	13	30	5	5	76	62	50
29	44	.....	256	99	274	12	24	5	4	82	57	48
30	67	.....	231	92	156	12	12	5	4	78	52	39
31	59	.....	443	.....	123	.....	9	4	.....	65	.....	39

Monthly discharge of Dog River at Northfield, Vt., for 1913.

[Drainage area, 57 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
January	443	24	116	2.04	2.35	A.
February	111	.....	33.4	.586	.61	C.
March	2,100	13	311	5.46	6.30	A.
April	443	92	166	2.91	3.25	A.
May	274	38	81.5	1.43	1.65	A.
June	99	12	41.8	.733	.82	B.
July	30	5	11.6	.204	.24	C.
August	9	4	5.43	.0961	.11	C.
September	48	3	6.43	.113	.13	C.
October	156	4	41.4	.726	.84	B.
November	177	35	69.9	1.23	1.37	A.
December	136	31	64.7	1.14	1.31	A.
The year	2,100	3	79.5	1.39	18.98	

NOTE.—Discharge Feb. 9 to 20, inclusive, interpolated by comparison with records of nearby streams and a study of the climatologic records at Northfield.

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LAMOILLE RIVER AT CADYS FALLS, VT.

Location.—About 1,000 feet below power plant of Morrisville Electric Light & Power Co., 1,000 feet below the highway bridge at what was formerly known as Cadys Falls, and about 2 miles downstream from village of Morrisville; Hyde Park is 1 mile north. Both Hyde Park and Morrisville are on the St. Johnsbury & Lake Champlain Railroad.

Records available.—September 4 to December 31, 1913. A station was maintained in the village of Morrisville July 28, 1909, to July 13, 1910, and was replaced by a station at Johnson July 14, 1910. See Water-Supply Paper 324, page 126.

Drainage area.—Not measured.

Gage.—Gurley electric water-stage register in standard timber shelter over timber-lined well.

Control.—Gravel 500 feet below gage well defined; bed of stream smooth gravel.

Discharge measurements.—At low stages made by wading 500 feet below gage; at medium and high stages from a cable.

Winter flow.—Discharge relation affected by ice during extremely cold weather.

Accuracy.—Conditions for making discharge measurements are excellent. Rating curve fairly well defined. Diurnal fluctuation determined by recording gage.

Discharge measurements of Lamoille River at Cadys Falls, Vt., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Sept. 4[a]	G. H. Canfield	2.06	107
6[a]	....do	2.05	102
6[a]	....do	1.95	73.4
Oct. 31[b]	C. S. De Golyer	2.54	251

[a] Measurement made by wading. [b] Measurement made from cable.

NOTE.—Additional measurements made early in 1914 were used in determining the rating curve.

Daily gage height, in feet, of Lamoille River at Cadys Falls, Vt., for 1913.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	.....	2.04	2.50	2.42	16	1.95	2.02	2.16	2.42
2	.....	1.96	2.27	2.68	17	1.95	1.99	2.08	2.39
3	.....	1.98	2.48	2.89	18	1.96	1.95	2.17	2.41
4	2.06	2.09	2.50	3.00	19	1.95	1.87	2.19	2.26
5	2.05	2.01	2.45	2.69	20	1.95	2.27	3.34	2.28
6	2.01	1.99	2.33	2.57	21	1.87	2.80	2.94	2.25
7	1.93	1.97	2.28	2.34	22	1.99	2.44	2.67	2.26
8	1.98	2.00	2.35	3.08	23	2.32	2.36	2.44	2.19
9	1.98	1.96	2.22	2.85	24	2.19	.....	2.52	2.14
10	2.03	1.97	2.51	2.66	25	2.16	.....	2.53	2.22
11	1.98	2.00	2.49	2.52	26	2.08	.....	2.50	2.23
12	2.01	2.04	2.37	2.31	27	2.07	.....	2.35	2.13
13	1.94	2.13	2.26	2.45	28	2.00	.....	2.26	2.04
14	1.89	2.21	2.28	2.37	29	2.00	.....	2.31	.....
15	1.93	2.10	2.22	2.37	30	2.05	2.85	2.20	.....
					31	.....	262	.....	.....

NOTE.—Gage heights computed from records obtained by a Gurley electric water-stage register. No records obtained Oct. 24–29 and Dec. 29–31.

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Daily discharge, in second-feet, of Lamoille River at Cadys Falls, Vt., for 1913.

Day.	Sept.	Oct.	Nov.	Dec.	Day.	Sept.	Oct.	Nov.	Dec.
1	.....	99	237	211	16	78	94	a 132	211
2	.....	80	a 164	302	17	78	87	110	201
3	.....	84	230	383	18	80	78	135	207
4	105	112	237	428	19	78	a 60	140	161
5	102	a 92	220	305	20	78	164	578	167
6	92	87	182	262	21	a 60	347	403	a 158
7	a 73	82	167	a 185	22	87	217	298	161
8	84	89	188	462	23	179	192	a 217	140
9	84	80	a 149	367	24	140	.....	244	126
10	97	82	240	294	25	132	.....	248	149
11	84	89	234	244	26	110	.....	237	152
12	92	a 99	195	176	27	107	.....	188	123
13	75	123	161	220	28	a 89	.....	161	a 99
14	a 64	146	167	a 195	29	89	.....	176	.....
15	73	115	149	195	30	102	367	a 143	.....
					31	.....	279	.....	.....

a Sunday.

NOTE.—Discharge computed from a fairly well-defined rating curve.

Monthly discharge of Lamoille River at Cadys Falls, Vt., for 1913.

Month.	Discharge in second-feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
September 4–30	179	60	93	B.
October	.....	60	188	B.
November	578	110	211	A.
December	462	99	213	A.

NOTE.—Discharge for period Oct. 24–29 estimated by comparison with records at Johnson, Vt. Discharge for Dec. 29, 30, and 31 estimated at 110 second-feet.

LAMOILLE RIVER AT JOHNSON, VT.

Location.—At highway bridge on main road from railroad station to post office in town of Johnson, Vt., and about 400 feet above the mouth of Ginon River.

Records available.—July 14, 1910, to December 31, 1913. From July 28, 1909, to July 13, 1910, a station was maintained on Lamoille River at Morrisville, Vt.

Drainage area.—Not measured.

Gage.—Chain gage fastened to the handrail of the bridge; read daily, morning and evening, to tenths.

Control.—Channel fairly permanent; bed composed of gravel; ledge rock projects from the left bank; a small gravel riffle about 350 feet below the bridge indicates no backwater from Ginon River at ordinary stages.

Discharge measurements.—At high stages made from highway bridge; at low stages made by wading about 500 feet above the bridge.

Regulation.—Operation of mills and power plants above the station cause considerable daily fluctuations in flow.

Winter flow.—Discharge relation affected by ice.

Floods.—Flood of March, 1913, reached a peak stage of 12.4 feet at 6 p. m. March 25 and a maximum stage of 13 feet at 6 p. m. March 27, as indicated by the observer's records and later verified by an engineer of the Survey from high-water marks. Maximum discharge, approximately 8,500 second-feet.

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Accuracy.—Rating curve fairly well defined for ordinary stages. Two gage-height readings a day and corresponding discharge values are published, as it is not known how closely the semidaily readings indicate the mean gage height for the day.

Discharge measurements of Lamoille River at Johnson, Vt., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 7[a]	C. S. De Golyer	5.49	235	Aug. 20[b]	G. H. Canfield	2.18	93
29	R. S. Barnes	6.12	2,190	20[b]	do	2.37	136
Apr. 25	do	3.35	555				

[a] Measurement made under complete ice cover. [b] Measurement made by wading.

Gage height, in feet, and discharge, in second-feet, of Lamoille River at Johnson, Vt., for 1913.

[F. M. Ward, observer.]

Day.	January.				February.				March.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	3.0	345	3.3	465								
2	3.0	345	3.2	425								
3	3.1	385	3.0	345								
4	4.6	1,140	4.7	1,200								
5	4.3	965	4.0	800								
6	4.0	800	3.8	700								
7	3.7	650	3.8	700								
8	3.6	600	3.8	700								
9	4.0	800	3.9	750								
10	3.7	650	3.6	600								
11	4.5		4.8									
12	4.2		4.0									
13												
14												
15												
16									11.0		9.3	
17									6.0		5.9	
18									5.6		5.4	
19									5.0		5.9	
20	8.6		8.4						6.0		7.3	
21	9.2		9.4						8.3		9.0	
22	8.0		8.3						12.6		9.3	
23	7.5		7.3						7.0		5.9	
24	7.2		7.3						5.2	1,530	5.7	1,860
25	6.8		6.9						8.0	3,650	12.4	7,840
26	6.3		6.1						10.6	5,980	11.0	6,360
27	6.7		6.8						8.8	4,310	13.0	8,500
28	6.0								9.8	5,220	8.3	3,890
29									6.3	2,300	6.2	2,230
30									5.9	2,020	4.7	1,200
31									5.0	1,400	7.6	3,330

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Gage height, in feet, and discharge, in second-feet, of Lamoille River at Johnson, Vt., for 1913—Continued.

Day.	April.				May.				June.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	7.3	3,090	6.4	2,370	3.1	385	3.0	345	3.9	750	3.6	600
2	5.5	1,740	5.2	1,530	3.0	345	2.8	275	3.4	510	3.2	425
3	4.8	1,260	4.6	1,140	3.0	345	2.9	310	3.2	425	3.4	510
4	5.0	1,400	6.4	2,370	2.8	275	2.7	242	3.0	345	2.8	275
5	8.4	3,970	8.4	3,970	2.8	275	2.8	275	2.9	310	3.0	345
6	6.0	2,090	5.8	1,950	2.8	275	2.9	310	2.8	275	2.9	310
7	5.4	1,670	5.0	1,400	2.9	310	2.8	275	2.6	212	3.0	345
8	4.5	1,080	4.3	965	2.75	258	2.8	275	2.9	310	3.0	345
9	4.4	1,020	4.25	938	2.8	275	2.9	310	3.0	345	3.1	385
10	4.3	965	4.1	855	2.7	242	2.8	275	3.0	345	2.8	275
11	4.1	855	4.4	1,020	2.7	242	2.6	212	2.2	119	2.3	140
12	4.5	1,080	4.7	1,200	2.6	212	2.55	199	2.2	119	2.3	140
13	4.5	1,080	4.4	1,020	2.5	186	2.6	212	2.4	162	2.6	212
14	4.5	1,080	4.45	1,050	2.6	212	2.5	186	2.2	119	2.1	99
15	4.3	965	4.4	1,020	2.5	186	2.6	212	2.1	99	2.3	140
16	4.45	1,050	4.4	1,020	2.5	186	2.45	174	2.3	140	2.6	212
17	4.1	855	4.0	800	2.5	186	2.6	212	3.6	600	3.4	510
18	4.0	800	3.8	700	2.6	212	2.5	186	2.9	310	3.0	345
19	4.1	855	5.65	1,840	2.8	275	2.85	292	2.6	212	2.7	242
20	5.4	1,670	5.0	1,400	2.8	275	2.75	258	2.7	242	2.5	186
21	4.0	800	3.9	750	2.6	212	2.7	242	2.4	162	2.3	140
22	3.9	750	3.8	700	2.7	242	2.8	275	2.2	119	2.1	99
23	3.8	700	3.7	650	2.9	310	3.2	425	2.2	119	2.45	174
24	3.6	600	3.5	555	3.0	345	2.9	310	2.3	140	2.5	186
25	3.7	650	3.4	510	3.4	510	3.2	425	2.4	162	2.5	186
26	3.4	510	3.5	555	3.8	700	3.6	600	2.4	162	2.5	186
27	3.6	600	3.4	510	3.0	345	2.9	310	2.8	275	2.6	212
28	3.3	465	3.3	465	3.2	425	3.6	600	2.4	162	2.2	119
29	3.3	465	3.2	425	6.0	2,090	6.3	2,300	2.3	140	2.4	162
30	3.2	425	3.1	385	6.2	2,230	5.0	1,400	2.3	140	2.35	151
31					4.6	1,140	4.0	800				

Day.	July.				August.				September.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	2.3	140	2.4	162	2.5	186	2.6	212	2.2	119	2.2	119
2	2.2	119	2.3	140	2.4	162	2.5	186	2.1	99	2.2	119
3	2.3	140	2.4	162	2.5	186	2.4	162	2.2	119	2.3	140
4	2.2	119	2.3	140	2.3	140	2.4	162	2.2	119	2.3	140
5	2.1	99	2.2	119	2.4	162	2.3	140	2.1	99	2.2	119
6	2.4	162	2.3	140	2.3	140	2.35	151	2.1	99	2.1	99
7	2.4	162	2.3	140	2.3	140	2.4	162	2.2	119	2.3	140
8	2.25	130	2.4	162	2.2	119	2.4	162	2.1	99	2.2	119
9	2.2	119	2.3	140	2.2	119	2.2	119	2.1	99	2.3	140
10	2.4	162	2.8	275	2.2	119	2.3	140	2.1	99	2.2	119
11	2.8	275	2.9	310	2.3	140	2.4	162	2.1	99	2.25	130
12	2.5	186	2.5	186	2.3	140	2.35	151	2.0	81	2.3	140
13	2.4	162	2.3	140	2.3	140	2.4	162	2.1	99	3.0	345
14	2.3	140	2.4	162	2.3	140	2.4	162	2.0	81	2.1	99
15	2.3	140	2.4	162	2.3	140	2.3	140	2.0	81	2.2	119
16	2.3	140	2.2	119	2.3	140	2.2	119	2.0	81	2.1	99
17	2.3	140	2.2	119	2.2	119	2.3	140	2.0	81	2.2	119
18	2.4	162	2.3	140	2.3	140	2.1	99	2.0	81	2.3	140
19	2.9	310	3.0	345	2.2	119	2.3	140	2.0	81	2.2	119
20	2.4	162	2.5	186	2.3	140	2.25	130	2.0	81	2.1	99
21	2.3	140	2.2	119	2.2	119	2.3	140	2.0	81	2.3	140
22	2.3	140	2.2	119	2.2	119	2.25	130	2.8	275	3.6	600
23	2.3	140	2.1	99	2.2	119	2.4	162	2.8	275	2.6	212
24	2.3	140	2.4	162	2.3	140	2.2	119	2.4	162	2.6	212
25	2.4	162	2.6	212	2.1	99	2.3	140	2.4	162	2.3	140
26	2.5	186	2.4	162	2.2	119	2.3	140	2.4	162	2.25	130
27	2.3	140	2.3	140	2.3	140	2.4	162	2.3	140	2.25	130
28	2.4	162	3.0	345	2.3	140	2.4	162	2.4	162	2.3	140
29	3.8	425	3.1	385	2.3	140	2.35	151	2.3	140	2.0	81
30	3.0	345	2.9	310	2.3	140	2.4	162	2.1	99	2.2	119
31	2.8	275	2.7	242	2.2	119	2.3	140				

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Gage height, in feet, and discharge, in second-feet, of Lamoille River at Johnson, Vt., for 1913—Continued.

Day.	October.				November.				December.			
	A. M.		P. M.		A. M.		P. M.		A. M.		P. M.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	2.2	119	2.3	140	3.1	385	3.0	345	2.6	212	2.7	242
2	2.1	99	2.0	81	2.9	310	2.8	275	2.8	275	3.0	345
3	2.3	140	2.6	212	2.6	212	2.7	242	3.4	510	3.6	600
4	2.3	140	2.4	162	2.5	186	2.5	186	3.6	600	3.5	555
5	2.2	119	2.1	99	2.7	242	2.8	275	3.5	555	3.4	510
6	2.1	99	2.0	81	2.6	212	2.7	242	3.2	425	3.1	385
7	2.1	99	2.1	99	2.5	186	2.6	212	3.4	510	3.6	600
8	2.0	81	2.1	99	2.9	310	2.8	275	3.7	650	3.7	650
9	2.2	119	2.1	99	2.8	275	2.7	242	3.2	425	3.0	345
10	2.1	99	2.1	99	3.0	345	3.1	385	3.4	510	3.3	465
11	2.1	99	2.1	99	3.0	345	2.9	310	3.2	425	3.1	385
12	2.2	119	2.4	162	2.8	275	2.6	212	3.0	345	3.0	345
13	2.6	212	2.7	242	2.7	242	2.6	212	3.0	345	3.3	465
14	2.6	212	2.6	212	2.6	212	2.5	186	3.0	345	3.1	385
15	2.4	162	2.7	242	2.5	186	2.5	186	3.2	425	3.0	345
16	2.4	162	2.3	140	2.4	162	2.5	186	3.0	345	2.9	310
17	2.3	140	2.2	119	2.3	140	2.4	162	3.0	345	2.9	310
18	2.9	310	2.1	99	2.5	186	2.6	212	2.9	310	3.0	345
19	2.1	99	2.3	140	2.5	186	2.4	162	2.9	310	2.8	275
20	2.3	140	2.4	162	4.1	855	4.8	1,260	2.8	275	2.9	310
21	2.9	310	3.6	600	3.6	600	3.4	510	3.1	385	3.2	425
22	2.6	212	2.5	186	3.4	510	3.2	425	3.1	385	3.0	345
23	2.4	162	2.6	212	3.1	385	3.0	345	3.4	510	3.05	365
24	2.6	212	2.6	212	3.0	345	2.9	310	3.2	425	3.1	385
25	2.7	242	2.8	275	3.0	345	2.9	310	3.1	385	3.2	425
26	3.0	345	3.4	510	2.9	310	2.9	310	3.1	385	3.0	345
27	3.9	750	4.1	855	2.6	212	2.7	242	3.0	345	3.1	385
28	3.6	600	3.5	555	2.5	186	2.5	186	3.0	345	3.2	425
29	3.3	465	3.2	425	2.8	275	2.7	242	2.9	310	3.0	345
30	3.0	345	2.9	310	2.9	310	3.0	345	3.0	.....	3.4	.....
31	3.1	385	3.2	425	.....	.....	.....	.....	3.4	.....	3.6	.....

NOTE.—Discharge relation affected by ice from about Jan. 11 to Mar. 23 and about Dec. 30-31.

MISSISQUOI RIVER NEAR RICHFORD, VT.

Location.—At highway bridge 200 feet below Central Vermont Railway bridge, 3 miles downstream from Richford, about 3 miles below mouth of North Branch, and 2 miles above mouth of Trout River.

Records available.—May 29, 1909, to June 28, 1913; September 9 to December 13, 1913.

Drainage area.—300 square miles.

Gage.—Chain, fastened to the downstream side of the bridge; installed June 26, 1911. From May 29, 1909, to December 31, 1910, the gage was just below the plant of the Sweat, Comings Co., but this site was found unsatisfactory because of the great daily fluctuations caused by the operation of the turbines. Gage read daily, morning and evening, to half-tenths. Limits of use: Half-tenths below and tenths above 6.5 feet.

Control.—A well-defined riffle about half a mile downstream protects gage from backwater from mills. Channel deep; banks not liable to be overflowed; bed composed of gravel, bowlders, and rock ledge; current sluggish at low stages.

Discharge measurements.—At high stages made from downstream side of bridge; at low stages by wading.

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Regulation.—Considerable daily fluctuation at low water caused by operation of power plants above station.

Winter flow.—Discharge relation seriously affected by ice.

Floods.—Flood of March, 1913, reached maximum stage of 16.7 feet at 8.30 a. m. March 26, as indicated by the observer's records. Discharge approximately 11,700 second-feet, or 39 second-feet per square mile of area drained.

Accuracy.—Rating curve well defined. It is not known how closely semidaily observations indicate the true mean gage height for day.

Discharge measurements of Missisquoi River near Richford, Vt., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Mar. 3[a]	C. S. DeGolyer	7.34	281
Apr. 2	R. S. Barnes	10.24	3,860
22	do	7.10	1,170
Sept. 9[b]	G. H. Canfield	4.63	50.5

[a] Measurement made under complete ice cover. [b] Measurement made by wading.

Gage height, in feet, and discharge, in second-feet, of Missisquoi River near Richford, Vt., for 1913.

[P. Sloan, observer.]

Day.	March.						April.					
	A. M.			P. M.			A. M.			P. M.		
	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.
1												
2												
3							7.30	8.7	2,460			
4							8.30	8.0	1,860			
5							8.15	9.7	3,360			
6												
7							8.00	9.0	2,730			
8							7.45	8.3	2,120			
9							7.30	7.9	1,780			
10							7.30	7.4	1,380			
11							8.15	7.2	1,240			
12							7.30	7.4	1,380			
13												
14							7.15	7.2	1,240			
15							7.45	7.4	1,380			
16							8.15	7.6	1,540			
17							7.45	7.4	1,380			
18							8.00	7.3	1,310			
19							8.45	7.2	1,240			
20												
21	7.00	14.0	7,940				7.00	7.4	1,380			
22	8.30	15.4	9,810				7.00	7.1	1,160			
23							6.45	7.0	1,090			
24	7.45	11.8	5,330				7.15	6.8	950			
25				3.30	15.2	9,530	7.30	6.7	880			
26	8.30	16.7	11,700				6.45	6.7	880			
27	7.30	13.9	7,820	3.00	15.3	9,670						
28	8.15	14.6	8,730				7.30	6.3	620			
29	7.45	12.9	6,580				7.30	6.15	580			
30							7.15	6.0	445			
31												

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Gage height, in feet, and discharge, in second-feet, of Missisquoi River near Richford, Vt., for 1913—Continued.

Day.	May.						June.					
	A. M.			P. M.			A. M.			P. M.		
	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.
1	7.15	5.9	395									
2	9.00	5.85	372				6.00	6.9	1,020			
3	7.00	5.8	350				5.30	6.8	980			
4							6.00	6.6	815			
5	7.00	5.65	292				5.30	6.4	685			
6	6.45	5.55	258				5.30	6.1	500			
7	6.00	5.5	240				5.45	6.0	445			
8	6.00	5.45	225									
9	5.45	5.45	225				5.30	6.7	880			
10	6.15	5.45	225				5.30	6.25	590			
11							5.30	5.95	420			
12	5.45	5.3	182				5.30	5.85	372			
13	5.45	5.35	196				5.45	5.6	275			
14	7.45	5.3	182				5.30	5.55	258			
15	5.45	5.3	182									
16	5.45	5.3	182				5.30	5.4	210			
17	5.45	5.35	196				5.15	6.4	685			
18							6.45	6.4	685			
19	5.45	5.65	292				5.30	5.85	372			
20	5.30	6.25	590				5.30	5.55	258			
21	7.15	6.0	445				5.45	5.45	225			
22	5.30	5.7	310									
23	5.45	6.1	500				5.30	5.2	157			
24	5.30	6.45	718				6.45	5.1	135			
25							6.30	5.0	114			
26							5.30	5.0	114			
27	5.30	6.1	500				6.15	5.3	182			
28	7.15	6.15	530				5.30	5.7	310			
29	6.00	9.0	2,730									
30	6.00	9.8	3,450									
31	5.45	8.2	2,030									

Day.	September.						October.					
	A. M.			P. M.			A. M.			P. M.		
	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.
1							6.40	4.85	86	5.45	4.7	61
2							6.45	4.65	54	5.30	4.85	86
3							7.00	5.7	310	4.50	5.7	310
4							6.45	5.85	372			
5							7.15	5.5	240	5.15	5.3	182
6							6.45	5.2	157	5.10	5.3	182
7							6.40	5.0	114	4.50	5.0	114
8							6.45	5.0	114	5.10	4.75	69
9	7.45	4.62	50	4.55	4.6	47	6.35	4.95	104	4.45	5.1	135
10	6.25	4.4	24	5.35	4.5	35	6.45	5.0	114	5.15	5.1	135
11	6.55	4.65	54	4.45	4.7	61	7.00	4.9	95			
12	6.30	4.6	47	5.20	4.55	41	7.30	5.0	114	5.10	5.2	157
13	6.45	4.6	47				6.30	5.0	114	4.50	4.85	86
14	7.15	4.8	77	5.15	4.65	54	6.35	5.15	146	4.50	5.05	124
15	7.05	4.5	35	4.45	4.7	61	7.10	5.1	135	4.45	5.2	157
16	7.45	4.82	81	5.10	4.6	47	6.35	5.0	114	4.50	5.1	135
17	7.15	4.55	41				7.50	4.95	104	4.45	4.85	86
18	6.55	4.9	95	4.45	4.7	61	6.40	4.95	104			
19	7.50	4.7	61	5.30	4.7	61	7.15	5.0	114	4.45	4.95	104
20	7.25	4.8	77				7.10	5.05	124	4.50	5.0	114
21	7.20	4.85	86	5.00	4.6	47	6.30	6.0	445	5.10	6.25	590
22	6.50	4.75	69	5.30	5.5	240	6.35	6.2	560	4.50	6.0	445
23	6.45	6.5	750	4.45	6.4	685	6.30	5.8	350	5.10	5.5	240
24	6.45	5.95	420	4.50	5.75	330	6.50	5.4	210	4.40	5.45	225
25	6.25	5.35	196	5.45	5.3	182	6.25	5.4	210			
26	6.45	5.35	196	5.30	5.1	135	6.50	6.25	590	4.30	6.8	950
27	6.30	4.9	95				6.50	7.0	1,090	4.45	7.1	1,160
28	7.00	5.0	114	4.45	5.2	157	6.35	7.0	1,090	5.00	6.6	815
29	6.30	5.0	114	5.45	4.9	95	6.30	6.6	815	4.45	6.4	685
30	6.25	4.8	77	5.40	4.65	54	6.50	6.25	590	4.40	6.2	560
31							6.40	6.1	500	4.10	6.1	500

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Gage height, in feet, and discharge, in second-feet, of Missisquoi River near Richford, Vt., for 1913—Continued.

Day.	November.						December.					
	A. M.			P. M.			A. M.			P. M.		
	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.
1	6.50	5.9	395				7.25	5.8	350	4.10	6.0	445
2	7.30	5.75	330	4.20	5.7	310	7.15	5.95	420	4.20	5.8	359
3	6.55	5.6	275	4.30	5.6	275	7.45	6.2	560	3.50	7.0	1,000
4	7.05	5.55	258	4.50	5.85	372	7.20	6.8	950	4.10	6.8	950
5	6.25	6.05	472	4.45	6.0	445	7.50	6.6	815	4.15	6.6	815
6	6.30	5.85	372	4.40	5.7	310	7.10	6.3	620			
7	6.50	5.65	292	4.45	5.5	240	7.55	6.0	445	3.50	6.25	500
8	6.45	5.55	258				7.30	7.1	1,160	4.10	7.2	1,240
9	7.30	5.5	240	4.45	5.3	182	8.10	6.6	815	4.15	6.8	950
10	7.10	5.15	146	4.30	5.2	157	7.40	7.0	1,060	3.45	7.4	1,380
11	7.15	5.1	135	4.20	5.4	210	8.10	7.1	1,160	4.00	7.5	1,460
12	7.35	5.6	275	4.35	5.45	225	7.45	7.9	1,780	3.30	8.4	2,200
13	7.00	5.5	240	4.15	5.55	258	7.35	8.5	2,280			
14	7.10	5.45	225	4.20	5.55	258						
15	7.35	5.5	240									
16	7.40	5.35	196	4.10	5.4	210						
17	7.20	5.25	170	4.40	5.1	135						
18	7.35	5.4	210	4.35	5.35	196						
19	7.15	5.4	210	4.20	5.6	275						
20	7.10	7.55	1,500	4.30	8.4	2,200						
21	7.20	8.1	1,940	4.10	7.6	1,540						
22	7.35	6.8	950									
23	7.15	6.45	718	4.20	7.2	1,240						
24	8.05	7.1	1,160	4.30	7.0	1,090						
25	7.50	6.7	880	4.15	6.6	815						
26	7.10	6.4	685	4.20	6.4	685						
27	7.15	6.15	530	4.30	6.2	560						
28	8.15	5.9	395	4.10	5.6	275						
29	7.15	5.8	350									
30	8.10	5.8	350	4.15	5.75	330						
31												

ST. FRANCIS RIVER.

CLYDE RIVER AT WEST DERBY, VT.

Location.—Just below the plant of the Newport Electric Light Co., at West Derby, Vt.

Records available.—May 25, 1909, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff, in two sections; low section about 75 feet below the plant; high-water section nailed to a tree on right bank 10 feet farther downstream; datum unchanged. On August 10, 1910, a chain gage was attached to the same tree at the same datum. All records from chain gage since this date. Gage read daily, morning and evening, to quarter-tenths. Limits of use: Hundredths below 3.0, half-tenths from 3.0 to 4.0, and tenths above 4.0 feet.

Control.—Bed rough; fall of river rapid near and below the station.

Discharge measurements.—Made from highway bridge about half a mile below gage.

Regulation.—At West Derby are two dams. Part of water at upper dam is used by paper mill; remainder is delivered to water wheels at electric plant through steel penstock; total operating head for this dam about 108 feet. All flow from second dam diverted to wheels in the power house, giving a head of about 30 feet. Practically no water is stored at the upper dam, but a pond of considerable size may be made by building a dam above this point.

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Winter flow.—Discharge relation affected by ice during periods of extremely cold weather.

Floods.—High water of March 25–30, 1913, reached maximum stage of 5.8 feet gage height, as determined by engineers of Geological Survey from high-water marks. Corresponding discharge approximately 6,300 second-feet.

Accuracy.—Discharge rating curve fairly well defined. Mean gage heights computed from semidaily observations are uncertain.

Discharge measurements of Clyde River at West Derby, Vt., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 4[a]	C. S. De Golyer	2.21	130	Sept. 9[b]	G. H. Canfield	1.83	47.4
Apr. 1	R. S. Barnes	3.85	1,380	9[b]	do	1.87	52.4
23	do	2.98	481				

[a] Measurement made under complete ice cover at a section about one-half mile below gage, but very little ice at control.
[b] Measurement made by wading.

Gage height, in feet, and discharge, in second-feet, of Clyde River at West Derby, Vt., for 1913.

[E. C. Rogers, observer.]

Day.	January.						February.					
	A. M.			P. M.			A. M.			P. M.		
	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.
1	7.45	2.38	184	4.20	2.40	190						
2	7.55	2.38	184	4.10	2.38	184				3.00		
3	7.50	2.42	198	4.15	2.50	228						
4	7.45	2.52	237	4.00	2.60	272						
5	8.00	2.60	272	4.10	2.60	272						
6				3.45	2.62	282						
7	7.45	2.60	272	3.40	2.65	297						
8	8.00	2.70	322	4.50	2.72	333						
9	7.30	2.62	282	4.00	2.72	333						
10	7.35	2.62	282	4.10	2.60	272						
11	7.30	2.62	282	4.00	2.58	263						
12												
13												
14							10.40	2.45	209	4.45	2.42	198
15							9.00	2.25	145	5.00	2.30	158
16							7.30	2.22	137	5.10	2.28	153
17							7.50	2.25	145	4.30	2.28	153
18	10.30	2.68					7.10	2.20	132	5.00	2.30	158
19							7.20	2.18	128	6.40	2.22	137
20				2.30	2.90		7.30	2.20	132	5.00	2.20	132
21							7.10	2.30	158	5.10	2.28	153
22				12.50	3.1		7.00	2.28	153	5.00	2.32	164
23							7.10	2.25	145	5.20	2.28	153
24	10.30	2.98					7.20	2.25	145	5.10	2.25	145
25							7.20	2.22	137	5.35	2.25	145
26				2.00	2.85		7.30	2.25	145	5.00	2.30	158
27							7.25	2.20	132	4.45	2.28	153
28							7.30	2.20	132	4.30	2.20	132
29												
30												
31				1.00	2.58							

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Gage height, in feet, and discharge, in second-feet, of Clyde River at West Derby, Vt., for 1913—Continued.

Day.	March.						April.					
	A. M.			P. M.			A. M.			P. M.		
	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.
1	7.30	2.20	132	4.20	2.25	145	8.00	3.8	1,330	5.45	3.8	1,330
2	7.45	2.22	137	5.40	2.18	128	7.35	3.7	1,200	6.10	3.65	1,140
3	8.00	2.15	121	5.15	2.20	132	5.30	3.65	1,140	5.50	3.6	1,080
4	7.45	2.11	112	5.15	2.14	119	9.15	3.6	1,080	4.40	3.65	1,140
5	7.45	2.17	125	5.30	2.14	119	7.50	3.65	1,140	5.30	3.6	1,080
6	7.40	2.11	112	4.50	2.17	125	8.00	3.55	1,020	6.00	3.6	1,080
7	7.30	2.14	119	4.55	2.11	112	8.00	3.55	1,020	6.15	3.5	970
8	7.40	2.11	112	4.50	2.19	130	5.40	3.5	970	5.10	3.45	915
9	7.55	2.17	125	5.10	2.11	112	7.20	3.35	810	6.15	3.3	760
10	8.00	2.14	119	5.15	2.19	130	7.40	3.25	715	5.25	3.2	670
11	8.30	2.14	119	5.50	2.21	135	6.25	3.15	625	6.15	3.15	625
12	7.30	2.19	130	4.45	2.19	130	6.00	3.1	580	5.00	3.1	580
13	7.50	2.14	119	4.00	2.21	135	6.15	3.05	540	6.30	3.05	540
14	7.40	2.34	171	4.10	2.94	472	7.10	3.05	540	6.10	3.05	540
15	7.00	2.89	436	5.45	3.1	600	6.45	3.05	540	5.30	3.0	500
16	7.30	3.35	840	5.00	3.4	890	8.00	3.05	540	6.15	2.98	486
17	7.30	3.5	990	5.45	3.6	1,100	6.35	3.0	500	6.30	2.98	486
18	7.35	3.4	890	6.00	3.35	840	7.00	3.0	500	6.40	2.98	486
19	7.40	3.4	890	5.30	3.3	790	7.00	3.0	500	5.10	3.0	500
20	7.45	3.35	840	5.35	3.3	790	9.50	3.0	500	6.30	3.0	500
21	7.45	3.3	790	5.20	3.35	840	7.45	2.98	486	6.20	2.98	486
22	6.40	3.55	1,040	6.00	3.6	1,100	7.00	2.98	486	6.00	2.98	486
23	9.30	3.65	1,160	6.35	3.7	1,210	6.00	3.0	500	6.20	3.0	500
24	7.45	3.75	1,260	5.30	3.7	1,210	6.35	2.95	465	5.30	2.90	430
25	7.30	3.75	1,260	4.45	3.9	1,430	5.50	2.90	430	6.00	2.88	418
26	7.50	3.9	1,430	4.00	4.0	1,540	6.40	2.85	399	5.30	2.85	399
27	7.30	4.2	1,760	5.20	4.6	2,660	4.30	2.82	380	6.20	2.82	380
28	7.30	4.6	2,660	4.40	4.6	2,660	.....	.....	.....	6.00	2.80	368
29	7.45	4.6	2,660	5.30	4.5	2,450	5.30	2.80	368	6.40	2.75	340
30	7.45	4.4	2,260	4.30	4.4	2,260	6.00	2.75	340	6.10	2.70	313
31	8.00	3.95	1,530	5.30	3.95	1,530	.....	.....	.....	.....	.....	.....

Day.	May.						June.					
	A. M.			P. M.			A. M.			P. M.		
	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.
1	6.30	2.68	303	6.00	2.68	303	6.00	2.80	368	6.05	2.80	368
2	6.55	2.70	313	6.20	2.60	265	6.30	2.80	368	5.15	2.80	368
3	6.00	2.62	275	5.00	2.55	244	6.20	2.78	357	6.15	2.80	368
4	5.25	2.60	265	7.50	2.52	231	6.30	2.72	324	5.50	2.70	313
5	6.30	2.50	223	5.50	2.45	204	6.00	2.70	313	6.00	2.62	275
6	5.00	2.50	223	6.30	2.30	154	5.30	2.60	265	5.00	2.62	275
7	5.50	2.32	160	6.00	2.40	186	7.25	2.65	289	6.30	2.68	308
8	6.15	2.42	193	6.20	2.45	204	.....	.....	.....	7.00	2.52	231
9	6.20	2.48	216	6.50	2.50	223	7.05	2.65	289	6.30	2.50	223
10	6.50	2.45	204	5.30	2.40	186	.....	.....	.....	6.20	2.48	216
11	7.00	2.45	204	6.00	2.45	204	5.00	2.48	216	6.30	2.50	223
12	5.55	2.40	186	6.40	2.35	170	5.30	2.50	223	6.00	2.45	204
13	7.20	2.35	170	6.20	2.30	154	.....	.....	.....	5.50	2.42	193
14	7.10	2.32	160	5.45	2.30	154	6.25	2.40	186	6.45	2.32	160
15	6.10	2.32	160	5.50	2.25	140	6.30	2.40	186	7.00	2.30	154
16	7.15	2.30	154	6.30	2.30	154	7.40	2.38	180	6.00	2.28	148
17	7.00	2.30	154	6.00	2.30	154	6.50	2.32	160	6.20	2.30	154
18	7.25	2.25	140	6.10	2.25	140	6.15	2.30	154	5.50	2.28	148
19	7.15	2.30	154	7.10	2.32	160	6.05	2.30	154	6.50	2.30	154
20	7.00	2.32	160	6.00	2.30	154	6.10	2.30	154	6.30	2.25	140
21	6.40	2.35	170	5.40	2.35	170	6.10	2.30	154	6.00	2.20	126
22	7.00	2.40	186	6.30	2.38	180	6.10	2.25	140	7.00	2.18	121
23	6.10	2.40	186	6.00	2.38	180	6.05	2.20	126	6.45	2.15	113
24	6.40	2.42	193	6.00	2.45	204	6.05	2.20	126	6.30	2.12	105
25	7.00	2.48	216	5.55	2.50	223	6.00	2.15	113	6.15	2.15	113
26	6.30	2.52	231	6.15	2.52	231	7.10	2.15	113	7.00	2.10	100
27	6.55	2.52	231	6.00	2.52	231	.....	.....	.....	6.20	2.12	105
28	6.40	2.55	244	5.45	2.60	265	7.30	2.12	105	5.45	2.05	89
29	7.00	2.70	313	6.10	2.72	324	7.10	2.10	100	6.10	2.10	100
30	7.30	2.72	324	6.30	2.78	357	6.55	2.12	105	5.20	2.12	105
31	6.30	2.75	340	7.15	2.78	357	.....	.....	.....	.....	.....	.....

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Gage height, in feet, and discharge, in second-feet, of Clyde River at West Derby, Vt., for 1913—Continued.

Day.	July.						August.					
	A. M.			P. M.			A. M.			P. M.		
	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.
1	7.20	2.10	100	6.10	2.05	89	6.45	2.15	113	7.00	2.18	121
2	7.00	2.10	100	5.05	2.02	82	8.00	2.15	113	5.50	2.10	100
3	6.55	2.08	96	6.35	2.00	78	7.00	2.10	100	6.20	2.08	96
4	7.30	2.08	96	6.00	2.02	82	.....	.....	.....	6.30	2.22	132
5	6.10	2.05	89	6.20	2.02	82	7.00	2.12	105	6.10	2.05	89
6	6.00	2.08	96	6.30	2.00	78	6.00	2.08	96	4.50	2.00	78
7	7.40	2.05	89	6.25	2.00	78	7.30	2.08	96	5.40	2.02	82
8	7.25	1.98	74	6.10	1.88	56	5.55	2.00	78	6.10	1.95	68
9	5.25	1.95	68	7.00	1.98	74	7.05	2.00	78	5.45	1.98	74
10	7.35	2.00	78	6.05	1.92	63	7.20	2.02	82	5.40	2.08	96
11	6.30	2.05	89	5.10	2.02	82	7.30	2.10	100	5.00	2.00	78
12	8.15	2.05	89	6.00	2.10	100	6.45	1.98	74	6.20	1.95	68
13	6.30	2.15	113	6.10	2.20	126	6.15	2.00	78	5.20	1.92	63
14	5.30	2.20	126	6.30	2.20	126	7.00	2.00	78	7.10	1.88	56
15	7.00	2.22	132	6.15	2.18	121	6.55	2.00	78	5.30	1.95	68
16	7.30	2.20	126	6.30	2.12	105	6.15	1.98	74	7.15	1.85	50
17	5.45	2.20	126	5.30	2.20	126	7.15	1.90	59	6.15	1.92	63
18	7.05	2.15	113	6.50	2.18	121	6.10	1.92	63	6.10	1.90	59
19	.....	.....	.....	6.15	2.12	105	7.15	1.90	59	5.30	1.88	56
20	6.30	2.15	113	6.00	2.12	105	7.05	1.90	59	6.30	1.85	50
21	6.25	2.20	126	6.50	2.10	100	7.00	1.90	59	6.50	1.70	26
22	5.50	2.12	105	6.10	2.10	100	6.35	1.85	50	5.30	1.85	50
23	6.20	2.08	96	5.35	2.05	89	7.15	1.88	56	5.20	1.90	59
24	6.45	2.10	100	6.25	2.00	78	8.00	1.85	50	5.40	1.85	50
25	7.05	2.10	100	7.20	1.95	68	7.00	1.85	50	5.45	1.60	17
26	7.00	2.08	96	6.15	2.00	78	7.10	1.82	45	5.15	1.82	45
27	8.00	2.02	82	6.10	1.98	74	7.30	1.85	50	6.00	1.90	59
28	7.20	2.02	82	6.00	2.00	78	6.50	1.85	50	6.10	1.92	63
29	6.25	2.02	82	5.50	2.10	100	6.50	1.92	63	5.30	1.95	68
30	6.45	2.10	100	6.25	2.10	100	6.45	1.90	59	6.10	1.90	59
31	6.50	2.12	105	5.20	2.15	113	8.05	1.85	50	6.40	1.85	50

Day.	September.						October.					
	A. M.			P. M.			A. M.			P. M.		
	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.
1	6.30	1.85	50	5.30	1.82	45	8.00	1.90	59	5.20	1.92	63
2	6.35	1.85	50	5.45	1.88	56	6.30	1.90	59	5.00	2.00	78
3	7.50	1.85	50	5.30	1.85	50	7.10	1.92	63	5.30	1.92	63
4	6.20	1.88	56	5.40	1.82	45	7.15	1.90	59	5.30	1.95	68
5	7.30	1.82	45	6.00	1.85	50	7.30	1.90	59	5.00	1.88	56
6	6.10	1.85	50	4.30	1.85	50	6.30	1.90	59	5.20	1.90	59
7	6.15	1.82	45	6.30	1.88	56	6.40	1.95	68	5.40	1.88	56
8	7.10	1.85	50	5.30	1.85	50	7.50	1.88	56	5.15	1.90	59
9	7.45	1.82	45	.....	.....	.....	6.10	1.85	50	3.50	1.68	26
10	8.00	1.82	45	.....	.....	.....	7.35	1.85	50	5.30	1.98	74
11	7.00	1.82	45	4.05	1.78	39	6.40	1.88	56	5.20	1.90	59
12	7.15	1.80	42	5.15	1.80	42	7.45	1.92	63	3.45	1.92	63
13	7.00	1.80	42	6.55	1.82	45	6.50	1.90	59	5.10	1.95	68
14	7.25	1.82	45	6.00	1.85	50	7.50	1.90	59	5.10	1.90	59
15	.....	.....	.....	.....	.....	.....	6.05	1.98	74	5.00	1.92	63
16	7.50	1.82	45	5.10	1.80	42	7.30	2.02	82	5.05	2.02	82
17	7.25	1.82	45	6.15	1.82	45	7.30	2.08	96	5.15	2.05	89
18	8.00	1.80	42	5.00	1.85	50	7.00	2.08	96	4.50	2.05	89
19	7.20	1.88	56	5.10	1.90	59	9.00	2.08	96	5.00	2.05	89
20	6.10	1.82	45	4.05	1.78	39	6.10	2.05	89	5.00	2.22	132
21	7.35	1.82	45	4.10	1.85	50	7.00	2.22	132	5.05	2.22	132
22	7.20	1.90	59	4.40	2.00	78	6.45	2.32	160	4.55	2.45	204
23	7.40	1.95	68	5.10	1.95	68	6.50	2.42	193	4.50	2.50	223
24	7.00	1.90	59	.....	.....	.....	7.45	2.52	231	4.15	2.60	265
25	7.20	1.90	59	4.30	1.90	59	6.30	2.55	244	4.30	2.58	257
26	7.00	1.90	59	4.30	2.05	89	7.55	2.52	231	4.50	2.55	244
27	7.20	1.98	74	6.25	1.95	68	6.30	2.55	244	4.45	2.55	244
28	7.35	1.95	68	4.50	1.92	63	6.35	2.55	244	4.30	2.60	265
29	7.00	1.95	68	4.00	1.88	56	8.40	2.55	244	4.25	2.58	257
30	6.55	1.92	63	4.30	1.92	63	7.15	2.58	257	4.50	2.62	275
31	.....	.....	.....	.....	.....	.....	7.05	2.60	265	5.00	2.58	257

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Gage height, in feet, and discharge, in second-feet, of Clyde River at West Derby, Vt., for 1913—Continued.

Day.	November.						December.					
	A. M.			P. M.			A. M.			P. M.		
	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.	Time.	Gage height.	Discharge.
1	7.35	2.52	231	4.10	2.50	223	7.25	2.20	126	4.00	2.18	121
2	7.50	2.48	216	4.30	2.48	116	7.45	2.20	126	7.30	2.15	113
3	8.15	2.45	204	4.40	2.40	186	7.45	2.20	126	4.00	2.20	126
4	8.00	2.40	186	4.25	2.38	180	7.00	2.22	132	4.05	2.20	126
5	6.45	2.35	170	4.45	2.32	160	8.00	2.20	126	4.25	2.25	140
6	6.50	2.32	160	4.40	2.30	154	7.50	2.25	140	4.20	2.22	132
7	6.20	2.32	160	4.25	2.30	154	7.35	2.25	140	4.00	2.25	140
8				4.15	2.28	148	8.40	2.28	148	4.15	2.32	160
9	7.50	2.25	140	4.30	2.25	140	7.25	2.30	154	4.10	2.28	148
10	7.50	2.25	140	4.40	2.25	140	7.15	2.30	154	4.00	2.30	154
11	6.35	2.22	132	4.25	2.20	126	7.15	2.30	154	4.10	2.32	160
12	7.35	2.20	126	4.30	2.25	140	7.20	2.32	160	3.30	2.48	216
13	6.30	2.22	132	4.10	2.25	140	7.25	2.30	154	4.15	2.30	154
14				4.20	2.22	132	7.40	2.30	154	3.40	2.22	132
15	7.35	2.20	126	4.15	2.15	113	7.15	2.30	154	4.00	2.20	126
16	7.20	2.12	105	4.30	2.15	113	8.15	2.22	132	3.25	2.20	126
17	7.30	2.20	126	4.40	2.15	113	8.00	2.20	126	4.10	2.20	126
18	7.35	2.18	121	3.20	2.00	78	7.45	2.20	126	4.15	2.20	126
19	6.45	2.15	113	4.00	2.15	113	7.15	2.20	126	4.05	2.18	121
20	6.55	2.26	140	4.15	2.20	126	7.30	2.20	126	4.00	2.15	113
21	7.60	2.25	140	4.00	2.28	148	7.30	2.20	126	4.35	2.15	113
22	6.50	2.30	154	4.00	2.30	154	8.15	2.12	105	4.15	2.10	100
23	8.55	2.38	180	3.00	2.38	180	7.15	2.12	105	4.00	2.08	96
24	8.10	2.38	180	4.10	2.38	180	7.35	2.15	113	3.40	2.15	113
25	6.50	2.40	186	3.55	2.38	180	8.15	2.15	113	4.20	2.10	100
26	7.20	2.35	170	4.25	2.35	170	8.10	2.15	113	3.30	2.12	105
27	6.50	2.30	154	4.30	2.28	148	7.45	2.12	105	4.10	2.20	126
28	7.15	2.30	154	7.30	2.18	121	7.50	2.22	132	4.35	2.18	121
29	8.00	2.25	140	4.00	2.20	126	7.50	2.42	193	4.20	2.50	223
30	8.05	2.20	126	4.20	2.18	121	7.40	2.48	216	4.00	2.30	154
31							7.25	2.30	154	4.00	2.28	148

NOTE.—Discharge relation affected by ice about Jan. 12 to Feb. 13.

MISCELLANEOUS MEASUREMENTS.

Discharge measurements at points other than regular gaging stations were made during 1913 as shown by the following table:

Miscellaneous measurements in St. Lawrence River drainage basin in 1913.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
July 31	Black River	Lake Ontario	Davis Bridge, Port Leyden, N. Y.	[a]15.0	166
Aug. 8	....do	....do	....do	[a]14.5	20.1
Nov. 6	Black River canal	....do	2 miles above Delta dam		72.5
6	....do	....do	1 mile below Delta dam		128
July 29	Forestport feeder	Black River canal	Hawkinsville, N. Y.	[b]0.80	262
Aug. 5	....do	....do	....do	[b].82	247
4	Spillway [c]	Black River	Boonville, N. Y.	.54	18.7
Mar. 16	South Branch, Oswegatchie River.	Oswegatchie River	Talcville, N. Y.	[a]2.50	2,520
Aug. 27	....do	....do	....do	[d]3.65	113
Nov. 1	....do	....do	....do	[d]5.70	748

[a] Reference point on highway bridge.
[b] Reference point near highway bridge.
[c] On Black River Canal.
[d] Tail race gage.

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Miscellaneous measurements of Beaver River at State Dam, N. Y., in 1912–13.

Date.	Hydrographer.	Gate		Lake elevation.	Discharge.
		No.	Opening.		
1912.				*Feet.*	*Sec.-ft.*
Oct. 17	Frank Weber	1	Full	4.70	184
18	....do	4	Half	4.70	139
18	....do	1,4	....do	4.70	263
1913.					
Sept. 30	O. W Hartwell	4	Full	3.00	62.0
30	....do	4	Half	3.00	62.2
Oct. 22	G. H. Canfield	4	Quarter	9.42	65.4
22	....do	4	Half	9.45	128
23	....do	1	Quarter	9.92	70.6
23	....do	1	Half	9.96	136
23	....do	3	....do	10.04	128
24	....do	3	Three-quarters	10.28	178
24	....do	4	....do	10.30	178
24	....do	4	Full	10.30	204
24	....do	1	Three-quarters	10.30	183
25	....do	1	44½ inches	10.51	212

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FOR THE YEAR ENDING SEPTEMBER 30

1913

PART V. HUDSON BAY BASINS AND UPPER MISSISSIPPI RIVER

NATHAN C. GROVER, Chief Hydraulic Engineer

W. A. LAMB and W. G. HOYT, District Engineers

Prepared in cooperation with the States of Minnesota and Iowa

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SURFACE WATER SUPPLY OF HUDSON BAY BASINS AND UPPER MISSISSIPPI RIVER FOR THE YEAR ENDING SEPTEMBER 30, 1913.

AUTHORIZATION AND SCOPE OF WORK.

This volume is one of a series of twelve reports presenting results of measurements of flow made on streams in the United States during 1913. Six of the reports for 1913 contain data for the year ending September 30, and the other six for the calendar year, as indicated in the table on page 6.

The data presented in these reports were collected by the United States Geological Survey under authority implied in the organic law (20 Stat. L., p. 394), which contains the following paragraph:

Provided, That this officer [the Director] shall have the direction of the geological survey and the classification of public lands and examination of the geological structure, mineral resources, and products of the national domain.

The work was begun in 1888 in connection with special studies of water supply for irrigation. Since the fiscal year ending June 30, 1895, successive sundry civil bills passed by Congress have carried the following item and appropriations:

For gaging the streams and determining the water supply of the United States, and for the investigation of underground currents and artesian wells, and for the preparation of reports upon the best methods of utilizing the water resources.

Annual appropriations for the fiscal years ending June 30, 1895–1914.

1895	$12,500
1896	20,000
1897 to 1900, inclusive	50,000
1901 to 1902, inclusive	100,000
1903 to 1906, inclusive	200,000
1907	150,000
1908 to 1910, inclusive	100,000
1911 to 1914, inclusive	150,000

In the execution of the work many private and State organizations have cooperated, either by furnishing data or by assisting in collecting data. Acknowledgments for cooperation of the first kind are made in connection with the description of each station affected, and of the second kind on page 16.

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Measurements of stream flow have been made at about 3,000 points in the United States, and also at many points in small areas in Seward Peninsula and the Yukon-Tanana region, Alaska, and in the Hawaiian Islands. In July, 1913, 1,388 gaging stations were being maintained by the Survey and the cooperating organizations in the United States, and many miscellaneous discharge measurements were made at other points. In connection with this work data were also collected in regard to precipitation, evaporation, storage reservoirs, river profiles, and water power in many sections of the country and will be made available in the regular water-supply papers from time to time.

PUBLICATIONS.

A report has been prepared for each year embodying the stream-flow data collected during that year. An index to the reports containing stream-flow measurements prior to 1904 has been published as Water-Supply Paper 119. Circulars are also available giving complete lists of the gaging stations maintained by the Survey to date, and a list of the reports relating to the water supply of the country.

Prior to 1901 gage heights and discharge measurements were published in water-supply papers or bulletins and estimates of monthly discharge in annual reports; since 1901 both classes of data have been published in water-supply papers, and they are now being published in 12 parts, as shown in the following table:

Papers on surface water supply of the United States, 1913.

Part.	No.	Title.	Year used.
I	351	North Atlantic coast basins	Calendar year.
II	352	South Atlantic coast and eastern Gulf of Mexico basins	Do.
III	353	Ohio River Basin	Year ending Sept. 30.
IV	354	St. Lawrence River Basin	Calendar year.
V	355	Upper Mississippi River and Hudson Bay basins	Year ending Sept. 30.
VI	356	Missouri River Basin	Calendar year.
VII	357	Lower Mississippi River Basin	Do.
VIII	358	Western Gulf of Mexico basins	Year ending Sept. 30.
IX	359	Colorado River Basin	Calendar year.
X	360	Great Basin	Year ending Sept. 30.
XI	361	Pacific coast basins in California	Do.
XII	362	North Pacific coast basins	Do.

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A list of reports containing stream-flow data is presented in the following table:

Stream-flow data in reports of the United States Geological Survey.

[A=Annual Report; B=Bulletin; WS=Water-Supply Paper.]

Report.	Character of data.	Year.
10th A, pt. 2	Descriptive information only	
11th A, pt. 2	Monthly discharge	1884 to Sept., 1890.
12th A, pt. 2	do	1884 to June 30, 1891.
13th A, pt. 3	Mean discharge in second-feet	1884 to Dec. 31, 1892.
14th A, pt. 2	Monthly discharge (long-time records, 1871 to 1893)	1888 to Dec. 31, 1893.
B 131	Descriptions, measurements, gage heights, and ratings	1893 and 1894.
16th A, pt. 2	Descriptive information only	
B 140	Descriptions, measurements, gage heights, ratings, and monthly discharge (also many data covering earlier years).	1895.
WS 11	Gage heights (also gage heights for earlier years)	1896.
18th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also similar data for some earlier years).	1895 and 1896.
WS 15	Descriptions, measurements, and gage heights for eastern United States, eastern Mississippi River, and Missouri River above junction with Kansas.	1897.
WS 16	Descriptions, measurements, and gage heights for western Mississippi River below junction of Missouri and Platte, and western United States.	1897.
19th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also some long-time records).	1897.
WS 27	Measurements, ratings, and gage heights for eastern United States, eastern Mississippi River, and Missouri River.	1898.
WS 28	Measurements, ratings, and gage heights for Arkansas River and western United States.	1898.
20th A, pt. 4	Monthly discharge (also for many earlier years)	1898.
WS 35 to 39	Descriptions, measurements, gage heights, and ratings	1899.
21st A, pt. 4	Monthly discharge	1899.
WS 47 to 52	Descriptions, measurements, gage heights, and ratings	1900.
22d A, pt. 4	Monthly discharge	1900.
WS 65, 66	Descriptions, measurements, gage heights, and ratings	1901.
WS 75	Monthly discharge	1901.
WS 82 to 85	Complete data	1902.
WS 97 to 100	do	1903.
WS 124 to 135	do	1904.
WS 165 to 178	do	1905.
WS 201 to 214	do	1906.
WS 241 to 252	do	1907–8.
WS 261 to 272	do	1909.
WS 281 to 292	do	1910.
WS 301 to 312	do	1911.
WS 321 to 332 [a]	do	1912.
WS 351 to 362 [a]	do	1913.

[a] In preparation.

NOTE.—No data regarding stream flow are given in the 15th and 17th annual reports.

The table on page 8 gives, by years and drainage basins, the numbers of the papers on surface-water supply published from 1899 to 1913. The data for any particular station will be found in the reports covering the years during which the station was maintained. For example, data for any station in the area covered by Part I are published in Water-Supply Papers 97, 124, 165, 201, 241, 261, 281, 301, 321, and 351, which contain records for the New England streams from 1903 to 1913. The year covered by the report is indicated at the head of the column in which the paper is listed.

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Numbers of water-supply papers containing results of stream measurements, 1899–1913.

	1899 [a]	1900 [b]	1901	1902	1903	1904	1905	1906	1907–8	1909	1910	1911	1912	1913
North Atlantic	35	47, [c] 48	65, 75	82	97	[d] 124, [e] 125, [f] 126	[d] 165, [e] 166, [f] 167	[d] 201, [e] 202, [f] 203	241	261	281	301	321	351
South Atlantic and eastern Gulf of Mexico	[g] 35, 36	48	65, 75	[g] 82, 83	[g] 97, 98	[f] 126, 127	[f] 167, 168	[f] 203, 204	242	262	282	302	322	352
Ohio River basin	36	48, [h] 49	65, 75	83	98	128	169	205	243	263	283	303	323	353
St. Lawrence River and Great Lakes	36	49	65, 75	[i] 82, 83	97	129	170	206	244	264	284	304	324	354
Hudson Bay and Upper Mississippi River	36	49	[j] 65, 66, 75	[j] 83, 85	[j] 98, 99, [k] 100	[j] 128, 130	171	207	245	265	285	305	325	355
Missouri River	[l] 36, 37	49, [m] 50	66, 75	84	99	130, [n] 131	172	208	246	266	286	306	326	356
Lower Mississippi River	37	50	[j] 65, 66, 75	[j] 83, 84	[j] 98, 99	[j] 128, 131	[j] 169, 173	[j] 205, 209	247	267	287	307	327	357
Western Gulf of Mexico	37	50	66, 75	84	99	132	174	210	248	268	288	308	328	358
Colorado River	[o] 37, 38	50	66, 75	85	100	133	175, [p] 177	211	249	269	289	309	329	359
Great Basin	38, [q] 39	51	66, 75	85	100	133, [r] 134	176, [r] 177	212, [r] 213	250, [r] 251	270, [r] 271	290, [r] 291	310	330	360
California	38, [s] 39	51	66, 75	85	100	134	177	213	251	271	291	311	331	361
North Pacific	38	51	66, 75	85	100	135	177, 178	214	252	272	292	312	[t] 332	[t] 362

[a] Rating tables and index to Water-Supply Papers 35–39 contained in Water-Supply Paper 39.
[b] Rating tables and index to Water-Supply Papers 47–52 and data on precipitation, wells, and irrigation in California and Utah contained in Water-Supply Paper 52.
[c] Wissahickon and Schuylkill rivers to James River.
[d] New England rivers only.
[e] Hudson River to Delaware River, inclusive.
[f] Susquehanna River to Yadkin River, inclusive.
[g] James River only.
[h] Scioto River.
[i] Lake Ontario and tributaries to St. Lawrence River proper.
[j] Tributaries of Mississippi from east.
[k] Hudson Bay only.
[l] Gallatin River.
[m] Loup and Platte rivers near Columbus, Nebr., and all tributaries below junction with Platte.
[n] Platte and Kansas rivers.
[o] Green and Gunnison rivers and Grand River above junction with Gunnison.
[p] Below junction with Gila.
[q] Mohave River only.
[r] Great Basin in California, excepting Truckee and Carson drainage basins.
[s] Kings and Kern rivers only.
[t] Rogue, Umpqua, and Siletz rivers only.
[u] In three parts: *A*, Pacific basins in Washington and upper Columbia River; *B*, Snake River basin; *C*, Lower Columbia River and Pacific basins in Oregon.

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Water-supply papers and other publications of the United States Geological Survey containing data in regard to the water resources of the United States may be obtained or consulted as indicated below:

1. Copies may be obtained free of charge by applying to the Director of the Geological Survey, Washington, D. C. The edition printed for free distribution is, however, small and is soon exhausted.

2. Copies may be purchased at nominal cost from the Superintendent of Documents, Government Printing Office, Washington, D. C., who will on application furnish lists giving prices.

3. Sets of the reports may be consulted in the libraries of the principal cities of the United States.

4. Complete sets are available for consultation in the local offices of the water-resources branch of the Geological Survey, as follows:

Albany, N. Y., Room 18, Federal Building.
Atlanta, Ga., Post Office Building.
St. Paul, Minn., Old Capitol Building.
Madison, Wis., Capitol Building.
Helena, Mont., Montana National Bank Building.
Denver, Colo., 302 Chamber of Commerce Building.
Salt Lake City, Utah, Federal Building
Boise, Idaho, 615 Idaho Building.
Phoenix, Ariz., 417 Fleming Building.
Portland, Oreg., 416 Couch Building.
Tacoma, Wash., Federal Building.
San Francisco, Cal., 328 Customhouse.
Los Angeles, Cal., Federal Building.
Santa Fe, N. Mex., Capitol Building.
Honolulu, Hawaii, Kapiolani Building.

A list of the Geological Survey's publications will be sent on application to the Director of the United States Geological Survey, Washington, D. C.

DEFINITION OF TERMS.

The volume of water flowing in a stream—the "run-off" or "discharge"—is expressed in various terms, each of which has become associated with a certain class of work. These terms may be divided into two groups—(1) those which represent a rate of flow, as second-feet, gallons per minute, miner's inches, and discharge in second-feet per square mile, and (2) those which represent the actual quantity of water, as run-off (depth in inches), acre-feet, and millions of cubic feet. The units used in this series of reports are second-feet, second-feet per square mile, run-off in inches, acre-foot, and millions of cubic feet. They may be defined as follows:

"Second-foot" is an abbreviation for "cubic foot per second" and is a unit for the rate of discharge of water flowing in a stream. A second-foot is the rate of discharge of water flowing in a channel of

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rectangular cross-section 1 foot wide and 1 foot deep at an average velocity of 1 foot a second. It is generally used as a fundamental unit from which others are computed by the use of the factors given in the tables of convenient equivalents (p. 11).

"Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, computed on the assumption that the run-off is distributed uniformly both as regards time and area.

"Run-off (depth in inches)" is the depth to which an area would be covered if all the water flowing from it in a given period were uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

An "acre-foot" is equivalent to 43,560 cubic feet, and is the quantity required to cover an acre to the depth of 1 foot. The term is commonly used in connection with storage for irrigation.

"Millions of cubic feet" is applied to quantities of water stored in reservoirs, and is most frequently used in studies of flood control.

Certain terms not in common use may be defined as follows:

"Control," "controlling section," and "point of control" are used to designate the cross section of the stream below the gage which controls or regulates the height of the water surface at the gage. The control may not be the same cross section at all stages.

"Discharge relation" equals "relation of gage height to discharge."

The "point of zero flow" is the stage or gage height at which the stream ceases to flow.

CONVENIENT EQUIVALENTS.

The following is a list of convenient equivalents for use in hydraulic computations:

Table for converting velocity in feet per second into velocity in miles per hour.

[1 foot per second=0.681818 mile per hour, or very nearly ⅔ mile per hour. 1 mile per hour=1.4667 feet per second, or very nearly 1½ feet per second. In computing the table the values 0.68182 and 1.4667 were used.]

Units.	Tenths.									
	0	1	2	3	4	5	6	7	8	9
0.....	0.000	0.068	0.136	0.205	0.273	0.341	0.409	0.477	0.545	0.614
1.....	.682	.750	.818	.886	.955	1.02	1.09	1.16	1.23	1.30
2.....	1.36	1.43	1.50	1.57	1.64	1.70	1.77	1.84	1.91	1.98
3.....	2.05	2.11	2.18	2.25	2.32	2.39	2.45	2.52	2.59	2.66
4.....	2.73	2.80	2.86	2.93	3.00	3.07	3.14	3.20	3.27	3.34
5.....	3.41	3.48	3.55	3.61	3.68	3.75	3.82	3.89	3.95	4.02
6.....	4.09	4.16	4.23	4.30	4.36	4.43	4.50	4.57	4.64	4.70
7.....	4.77	4.84	4.91	4.98	5.05	5.11	5.18	5.25	5.32	5.39
8.....	5.45	5.52	5.59	5.66	5.73	5.80	5.86	5.93	6.00	6.07
9.....	6.14	6.20	6.27	6.34	6.41	6.48	6.55	6.61	6.68	6.75

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Table for converting discharge in second-feet per square mile into run-off in depth in inches over the area.

Discharge in second-feet per square mile.	Run-off in inches.				
	1 day.	28 days.	29 days.	30 days.	31 days.
1.....	0.03719	1.041	1.079	1.116	1.153
2.....	.07438	2.083	2.157	2.231	2.306
3.....	.11157	3.124	3.236	3.347	3.459
4.....	.14876	4.165	4.314	4.463	4.612
5.....	.18595	5.207	5.393	5.578	5.764
6.....	.22314	6.248	6.471	6.694	6.917
7.....	.26033	7.289	7.550	7.810	8.070
8.....	.29752	8.331	8.628	8.926	9.223
9.....	.33471	9.372	9.707	10.041	10.376

NOTE.—For part of a month multiply the values for one day by the number of days.

Table for converting discharge in second-feet into run-off in acre-feet.

Discharge in second-feet.	Run-off in acre-feet.				
	1 day.	28 days.	29 days.	30 days.	31 days.
1.....	1.983	55.54	57.52	59.50	61.49
2.....	3.967	111.1	115.0	119.0	123.0
3.....	5.950	166.6	172.6	178.5	184.5
4.....	7.934	222.1	230.1	238.0	246.0
5.....	9.917	277.7	287.6	297.5	307.4
6.....	11.90	333.2	345.1	357.0	368.9
7.....	13.88	388.8	402.6	416.5	430.4
8.....	15.87	444.3	460.2	476.0	491.9
9.....	17.85	499.8	517.7	535.5	553.4

NOTE.—For part of a month multiply values for one day by the number of days.

Table for converting discharge in second-feet into run-off in millions of gallons.

Discharge in second-feet.	Run-off in millions of gallons.				
	1 day.	28 days.	29 days.	30 days.	31 days.
1.....	0.6463	18.10	18.74	19.39	20.04
2.....	1.293	36.20	37.48	38.78	40.08
3.....	1.939	54.30	56.22	58.17	60.12
4.....	2.585	72.40	74.96	77.56	80.16
5.....	3.232	90.50	93.70	96.95	100.2
6.....	3.878	108.6	112.4	116.3	120.2
7.....	4.524	126.7	131.2	135.7	140.3
8.....	5.171	144.8	149.9	155.1	160.3
9.....	5.817	162.9	168.7	174.5	180.4

NOTE.—For part of a month multiply the value for one day by the number of days.

Table for converting discharge in second-feet into run-off in millions of cubic feet.

Discharge in second-feet.	Run-off in millions of cubic feet.				
	1 day.	28 days.	29 days.	30 days.	31 days.
1.....	0.0864	2.419	2.506	2.592	2.678
2.....	.1728	4.838	5.012	5.184	5.356
3.....	.2592	7.257	7.518	7.776	8.034
4.....	.3456	9.676	10.024	10.368	10.712
5.....	.4320	12.095	12.530	12.960	13.390
6.....	.5184	14.514	15.036	15.552	16.068
7.....	.6048	16.933	17.542	18.144	18.746
8.....	.6912	19.352	20.048	20.736	21.424
9.....	.7776	21.771	22.554	23.328	24.102

NOTE.—For part of a month multiply values for one day by the number of days.

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1 second-foot equals 40 California miner's inches (law of March 23, 1901).
1 second-foot equals 38.4 Colorado miner's inches.
1 second-foot equals 40 Arizona miner's inches.
1 second-foot equals 7.48 United States gallons per second; equals 448.8 gallons per minute; equals 646,317 gallons for one day.
1 second-foot for one year covers 1 square mile 1.131 feet, or 13.572 inches deep.
1 second-foot for one year equals 31,536,000 cubic feet.
1 second-foot equals about 1 acre-inch per hour.
1 second-foot for one day equals 86,400 cubic feet.
1,000,000,000 (1 United States billion) cubic feet equals 11,570 second-feet for one day.
1,000,000,000 cubic feet equals 414 second-feet for one 28-day month.
1,000,000,000 cubic feet equals 399 second-feet for one 29-day month.
1,000,000,000 cubic feet equals 386 second-feet for one 30-day month.
1,000,000,000 cubic feet equals 373 second-feet for one 31-day month.
100 California miner's inches equals 18.7 United States gallons per second.
100 California miner's inches for one day equals 4.96 acre-feet.
100 Colorado miner's inches equals 2.60 second-feet.
100 Colorado miner's inches equals 19.5 United States gallons per second.
100 Colorado miner's inches for one day equals 5.17 acre-feet.
100 United States gallons per minute equals 0.223 second-foot.
100 United States gallons per minute for one day equals 0.442 acre-foot.
1,000,000 United States gallons per day equals 1.55 second-feet.
1,000,000 United States gallons equals 3.07 acre-feet.
1,000,000 cubic feet equals 22.95 acre-feet.
1 acre-foot equals 325,850 gallons.
1 inch deep on 1 square mile equals 2,323,200 cubic feet.
1 inch deep on 1 square mile equals 0.0737 second-foot per year.
1 foot equals 0.3048 meter.
1 mile equals 1.60935 kilometers.
1 mile equals 5,280 feet.
1 acre equals 0.4047 hectare.
1 acre equals 43,560 square feet.
1 acre equals 209 feet square, nearly.
1 square mile equals 2.59 square kilometers.
1 cubic foot equals 0.0283 cubic meter.
1 cubic foot of water weighs 62.5 pounds.
1 cubic meter per minute equals 0.5886 second-foot.
1 horsepower equals 550 foot-pounds per second.
1 horsepower equals 76.0 kilogram-meters per second.
1 horsepower equals 746 watts.
1 horsepower equals 1 second-foot falling 8.80 feet.
1½ horsepower equals about 1 kilowatt.

To calculate water power quickly: $\frac{\text{Sec.-ft.} \times \text{fall in feet}}{11}$ = net horsepower on water wheel realizing 80 per cent of theoretical power.

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EXPLANATION OF DATA.

The data presented in this report cover the year beginning October 1, 1912, and ending September 30, 1913, and not, as in previous reports, the calendar year. At the 1st of January in most parts of the country a large amount of precipitation for the preceding three months is stored, either as ground water, in the form of snow, or in lakes. This stored water passes off in the streams during the spring break up. At the end of September the only stored water available for run-off in the streams is possibly a small amount held in ground storage. Therefore the run-off for a year, beginning with October 1, is practically all derived from precipitation occurring within that year.

For each regular current-meter gaging station the following data, so far as available, are given: Description of the station, list of discharge measurements, table of daily gage height, table of daily discharge, table of monthly and yearly discharge and run-off. For stations located at weirs or dams the gage-height table is usually omitted.

In addition to statements regarding the location and installation of current-meter stations, the descriptions give information in regard to any condition which may affect the constancy of the discharge relation, covering such points as ice, logging, shifting channels, and backwater; also information regarding diversions which decrease the total flow at the measuring section. Statements are also made regarding the accuracy and reliability of the data.

The table of daily gage height shows the daily fluctuations of the surface of the river as found from the mean of the gage readings taken each day, usually in the morning and in the evening, though at many stations only one reading is made each day. At a comparatively few stations automatic gages are used, some of which give a continuous record of river stage in the form of a hydrograph and others a record printed at regular intervals, from which the mean daily gage height can be computed. The gage height given in the table represents the elevation of the surface of the water above the zero of the gage. All gage heights affected by the presence of ice in the streams or by backwater from obstructions are published as recorded, with suitable footnotes. The rating table is not applicable for such periods unless the proper corrections to the gage heights are known and applied. Attention is called to the fact that the zero of the gage is placed at an arbitrary datum and has no relation to zero flow or the bottom of the river. In general the zero is located somewhat below the lowest known flow, so that negative readings shall not occur.

In the tables of daily gage height the use of zeros in the hundredths place indicates the limits of accuracy to which the gage was read and to which the mean daily gage height was computed. If a gage is

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read to tenths or half tenths once a day or to tenths twice a day, no zeros appear in the hundredths place for any stage. If the gage is read to half tenths twice a day or to quarter tenths or hundredths, regardless of the number of readings a day, the gage heights are published to hundredths, and zeros appear in the hundredths place, below a certain limiting stage. This limiting stage is so selected that the average error in the mean daily discharge, resulting from not using the mean daily gage height to hundredths above that stage, shall not be greater than 2 per cent. For automatic gages the allowable average error of the daily discharge has been taken as 1 per cent. The selection of the percentage is arbitrary, but it should be noted that the maximum error will in all cases be twice the average error. In like manner half tenths are used from the hundredths limit to another higher limit, above which only tenths are used. It is the aim to have the gage-height observations at each gaging station recorded to the degree of refinement required by the above method of use, but in practice it is found necessary, in order to avoid confusion in the gage observer's record, to have the observations for all stages recorded to the degree of refinement required for low stages, which usually necessitates readings to hundredths of a foot.

The discharge measurements and gage heights are the base data from which rating tables, daily discharge tables, and monthly discharge tables are computed.

The rating table gives, either directly or by interpolation, the discharge in second-feet corresponding to every stage of the river recorded during the period for which it is applicable. It is not published in this report, but can be determined from the tables of daily gage heights and daily discharge.

The table of daily discharge determined from the rating table gives the discharge in second-feet corresponding to the mean of the gage readings observed each day.

In the table of monthly discharge the column headed "Maximum" gives the mean flow, as determined from the rating table, for the day when the mean gage height was highest. As the gage height is the mean for the day, it does not indicate correctly the stage when the water surface was at crest height and the corresponding discharge was consequently larger than given in the maximum column. Likewise in the column at "Minimum" the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" is the average flow in cubic feet for each second during the month. On this the computations for the remaining columns, which are defined on page —, are based.

The base data presented in this report, unless otherwise stated in description of station, have been collected by the methods commonly

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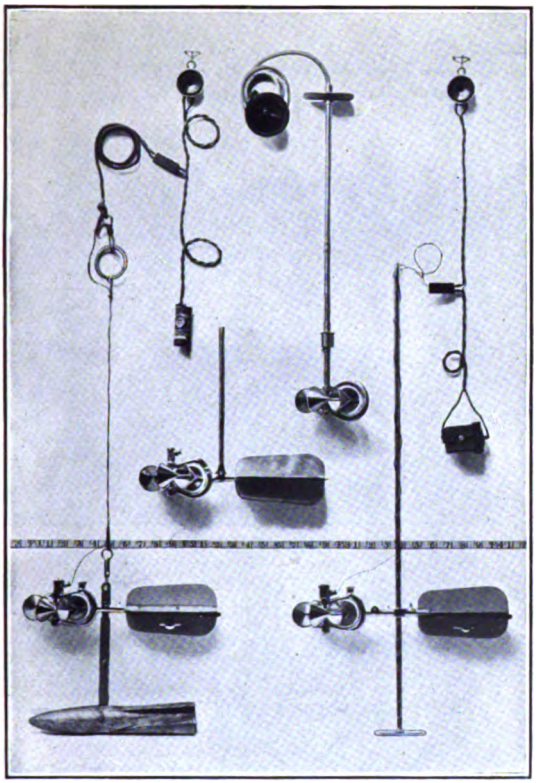
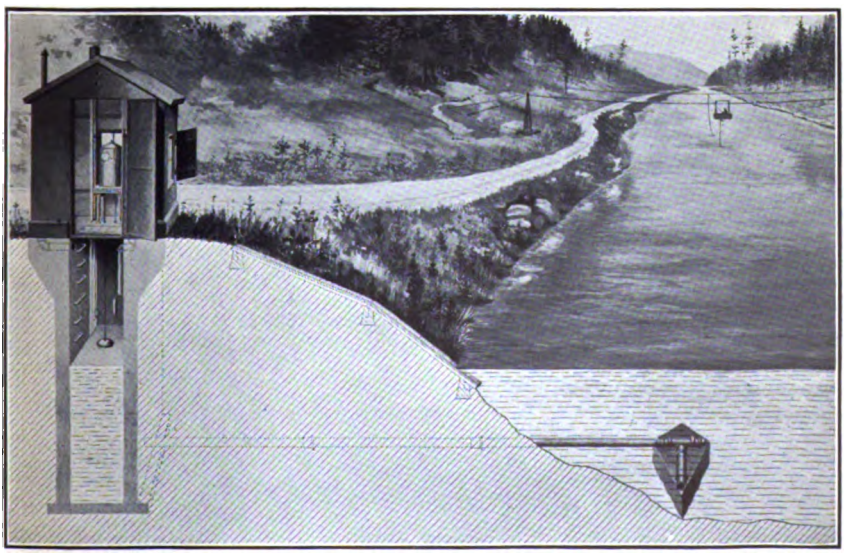


A. PRICE CURRENT METERS.



B. TYPICAL GAGING STATIONS.

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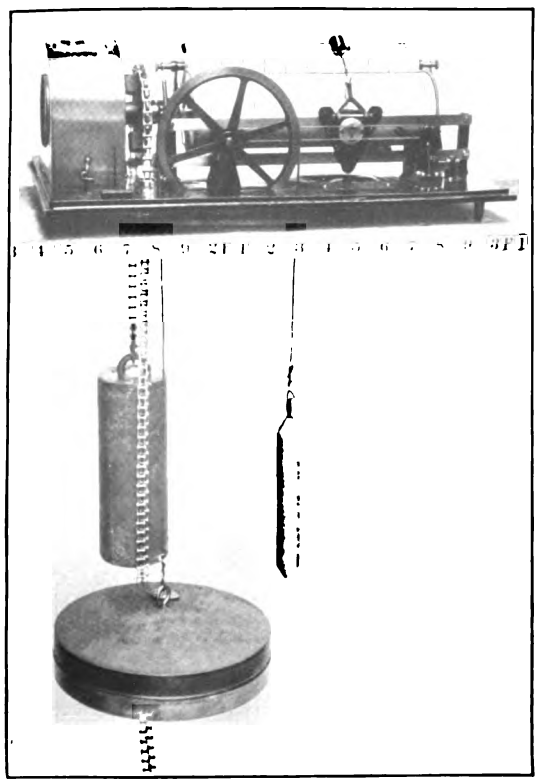
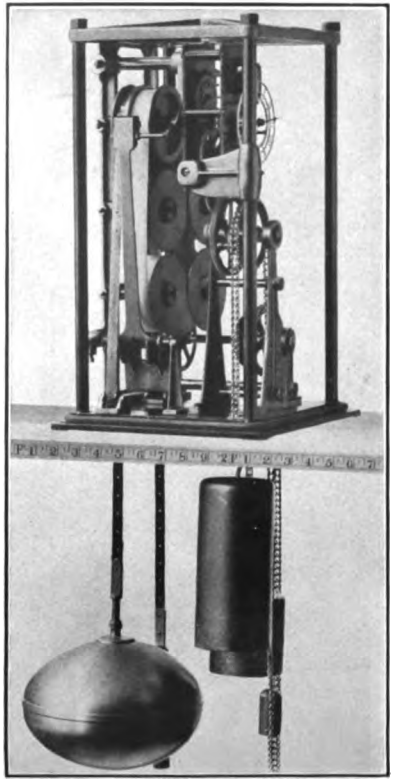
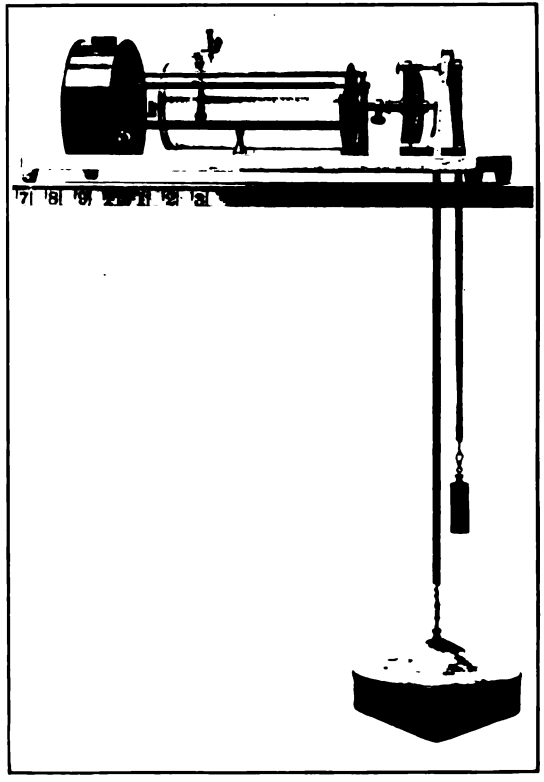


A. STEVENS.



B. GURLEY.



C. FRIEZ.

AUTOMATIC GAGES.

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used at current-meter gaging stations and described in standard textbooks. Plates I and II show current meters and gages used and typical gaging stations.

ACCURACY OF FIELD DATA AND COMPUTED RESULTS.

The accuracy of stream-flow data depends (1) on permanence of the relation between discharge and stage, and (2) on the accuracy of observation of stage, measurements of discharge, and interpretation of data.

In order to give engineers and others information regarding the probable accuracy of the computed results, footnotes are added to the daily discharge tables, stating the probable accuracy of the rating tables used, and an accuracy column is inserted in the monthly discharge table. For the rating tables, "well defined" indicates, in general, that the rating is probably accurate within 5 per cent; "fairly well defined," within 10 per cent; "poorly defined" or "approximate," within 15 to 25 per cent. These notes are very general and are based on the plotting of the individual measurements with reference to the mean rating curve.

The accuracy column in the monthly discharge table does not apply to the maximum or minimum nor to any individual day, but to the monthly mean. It is based on the accuracy of the rating, the probable reliability of the observer, the number of gage readings per day, the range of the fluctuation in stage, and knowledge of local conditions. In this column, A indicates that the mean monthly flow is probably accurate within 5 per cent; B, within 10 per cent; C, within 15 per cent; D, within 25 per cent. Special conditions are covered by footnotes.

Even though the monthly means for any station may represent with a high degree of accuracy the quantity of water flowing past the gage, the figures showing discharge per square mile and depth of run-off in inches may be subject to gross errors, which result from including in the measured drainage area large noncontributing districts or omitting estimates of water diverted for irrigation or other use. On this account the computations of "second-feet per square mile" and "run-off (depth in inches)" have not been made for stations draining areas having an annual rainfall of less than 20 inches, nor for those stations draining areas of over 20 inches of rainfall for which it is believed that the computations would be uncertain and misleading because of the presence of large noncontributing districts in the measured drainage area, of omitting estimates of water diverted for irrigation or other use, or of artificial control or unusual natural control of the flow of the river above the gaging station. All values of "second-feet per square mile" and

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"run-off (depth in inches)" previously published by the Survey should be used with exterme caution, and such values in this report should be used with care because of possible inherent sources of error not known to the Survey.

In general, the base data collected each year by the Survey engineers are published, not only to comply with the law, but also to afford any engineer the means of examining and adjusting to his own needs the results of the computations. The table of monthly discharge is so arranged as to give only a general idea of the flow at the station and should not be used for other than preliminary estimates. The determinations of daily discharge allow more detailed studies of the variation in flow by which the period of deficiency may be determined.

It should be borne in mind that the observations in each succeeding year may be expected to throw new light on data already collected and published, and the engineer who makes use of the figures presented in these papers should verify all ratings and make such adjustments for earlier years as may seem necessary.

COOPERATION.

During the year ending September 30, 1913, stream-gaging work in Montana was carried on in cooperation with the United States Reclamation Service.

In Minnesota the State cooperated under the terms of an act of the legislature of 1909 embodied in joint resolution 19, which reads as follows:

> Whereas the water supplies, water powers, navigation of our rivers, drainage of our lands, and the sanitary condition of our streams and their watersheds generally form one great asset and present one great problem: Therefore be it
>
> *Resolved (by the house of representatives) the senate concurring*, That the State Drainage Commission be, and is hereby, directed to investigate progress in other States toward the solution of said problem in such States, to investigate and determine the nature of soil problem in this State.

Prior to March 1, 1913, George A. Ralph, chief engineer of the State drainage commission, represented the State. From March 1 to September 30 E. V. Willard was acting State drainage engineer.

Work in Iowa during the year covered by this report was carried on under a cooperative agreement with the State geological survey, George F. Kay, director.

DIVISION OF WORK.

Field data for the Hudson Bay drainage basin, except in Minnesota, were collected under the direction of W. A. Lamb, district engineer, Helena, Mont. by E. F. Chandler, R. R. Randell, W. B.

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Stevenson, and E. J. Budge. The ratings and studies of the completed data were made by W. A. Lamb, E. F. Chandler, and B. J. Peterson. Estimates of flow during periods when the discharge relation was affected by ice were made by B. J. Peterson and E. F. Chandler.

Field data for the Hudson Bay drainage basin in Minnesota were collected under the direction of W. G. Hoyt, district engineer, St. Paul, Minn., by E. F. Chandler, S. B. Soulé, B. J. Peterson, W. B. Stevenson, and E. J. Budge. The ratings and studies of the completed data were made by W. G. Hoyt, E. F. Chandler, and B. J. Peterson. The estimates of flow during periods when the discharge relation was affected by ice were made by W. G. Hoyt and E. F. Chandler.

Field data for the upper Mississippi River drainage basin were collected under the direction of W. G. Hoyt, district engineer, St. Paul, Minn., by S. B. Soulé, and B. J. Peterson. The ratings and studies of the completed data were made by W. G. Hoyt and B. J. Peterson. Estimates of flow when the discharge relation was affected by ice were made by W. G. Hoyt.

The computations were made by J. G. Mathers, M. I. Walters, J. H. Morgan, E. D. Burchard, and B. J. Peterson.

The data were assembled for publication by B. J. Peterson.

The report was edited by Mrs. B. D. Wood.

STATION RECORDS.

HUDSON BAY DRAINAGE AREA IN THE UNITED STATES.

ST. MARY RIVER NEAR BABB, MONT.[1]

Location.—Near dam site a quarter of a mile below the outlet of Lower St. Mary Lake, 1 mile above mouth of Swiftcurrent Creek, and about 2 miles south of Babb, Mont.

Records available.—April 9, 1902, to September 30, 1913.

Drainage area.—177 square miles.

Gage.—Chain gage on right bank of stream. Temporary low-water gage used during winter months.

Channel and control.—Practically permanent.

Discharge measurements.—Made from cable 300 feet below gage. In September, 1909, the cable was moved from a point 300 feet farther downstream. Low-water measurements are made by wading one-fourth mile above gage.

Winter flow.—Channel freezes over at gage and considerable ice exists in the stream.

Floods.—Flood of June 5, 1908, reached a stage of about 9.4 feet.

Accuracy.—Rating curve well defined except for winter months. Accuracy of winter records impaired by changes in datum of temporary gage and possibly by effect of ice but are probably fair.

[1] The records for this station were published in Water-Supply Papers 85 and 100 as "St. Mary River at dam site near St. Mary," and in Water-Supply Paper 130 as "St. Mary River near St. Mary."

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Discharge measurements of St. Mary River near Babb, Mont., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 16	W. A. Lamb	1.16	[a] 117	June 10	R. R. Randell	5.40	2,980
Mar. 30	do	.94	[b] 86	Aug. 21	Lamb and Hoyt	2.43	604

[a] Measurement made from cable; ice along shore at gage and at measuring section.
[b] Measurement made by wading.

Daily gage height, in feet, of St. Mary River near Babb, Mont., for the year ending Sept. 30, 1913.

[Carl Giruin, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.5	1.5	1.4	0.9	0.85	0.95	0.6	1.95	5.5	4.7	2.8	2.5
2	1.4	1.55	1.3	.9	.85	.95	.6	2.05	5.8	4.5	2.8	2.5
3	1.4	1.5	1.3	.85	.85	.95	.5	2.15	5.8	4.4	2.7	2.45
4	1.3	1.5	1.35	.85	.85	.95	.5	2.0	5.9	4.2	2.7	2.5
5	1.4	1.5	1.3	.85	.9	.95	.5	2.1	5.9	4.1	2.7	2.45
6	1.4	1.5	1.3	.85	.9	1.0	.55	2.15	5.8	3.9	2.7	2.45
7	1.35	1.5	1.3	.85	.95	1.0	.6	2.15	5.6	3.9	2.8	.....
8	1.4	1.45	1.25	.85	.95	1.1	.7	2.15	5.5	3.8	2.8	2.05
9	1.4	1.5	1.3	.8	.95	1.1	.8	2.15	5.5	3.8	2.7	2.0
10	1.3	1.45	1.3	.8	.95	1.1	.9	2.0	5.4	3.7	2.6	1.95
11	1.35	1.45	1.2	.8	1.0	1.1	1.05	2.05	5.4	3.7	2.5	2.05
11	1.3	1.5	1.2	.8	1.0	1.1	1.15	2.05	5.4	3.7	2.6	1.9
13	1.35	1.5	1.2	.8	1.1	1.2	1.2	2.15	5.3	3.6	2.6	1.9
14	1.3	1.6	1.2	.85	1.1	1.2	1.25	2.2	5.2	3.4	2.5	.....
15	1.4	1.55	1.15	.85	1.1	1.2	1.45	2.3	5.1	3.4	2.6	1.8
16	1.4	1.55	1.2	.85	1.2	1.2	1.5	2.35	4.9	3.2	2.6	1.85
17	1.4	1.6	1.2	.8	1.1	1.2	1.55	2.45	4.6	3.2	2.5	1.8
18	1.4	1.55	1.2	.8	1.0	1.25	1.65	2.6	4.5	3.1	2.6	1.8
19	1.5	1.6	1.15	.8	.95	1.25	1.75	2.6	4.3	2.9	2.5	1.8
20	1.5	1.6	1.15	.85	.95	1.25	1.85	2.6	4.2	2.9	2.5	1.8
21	1.55	1.5	1.1	.85	.9	1.2	1.75	2.6	4.2	2.8	2.5	.....
22	1.5	1.5	1.1	.85	.9	1.1	1.75	2.6	4.1	2.8	2.45	1.7
23	1.6	1.5	1.1	.8	.9	1.1	1.65	2.6	4.2	2.8	2.45	1.65
24	1.55	1.5	1.1	.8	.9	1.1	1.65	2.7	4.1	2.9	2.5	1.65
25	1.6	1.45	1.1	.8	.9	1.0	1.65	2.8	4.1	2.9	2.45	1.65
26	1.55	1.5	1.05	.8	.95	.9	1.65	3.4	4.2	2.9	2.5	1.6
27	1.5	1.4	1.0	.8	.95	.8	1.75	3.9	4.3	2.9	2.45	1.5
28	1.6	1.4	1.0	.8	.95	.7	1.75	4.6	4.4	2.9	2.5	1.5
29	1.55	1.4	1.0	.85	.....	.7	1.8	5.1	4.5	2.9	2.45	1.5
30	1.6	1.35	.95	.85	.....	.65	1.9	5.4	4.5	2.9	2.45	1.5
31	1.55	.....	.95	.85	.....	.6	.....	5.5	.....	2.9	2.4	.....

NOTE.—Discharge relation probably affected by ice about Feb. 6–20, 1913.

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Daily discharge, in second-feet, of St. Mary River near Babb, Mont., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	225	225	195	79	72	88	40	385	3,080	2,280	815	645
2	195	241	166	79	72	88	40	425	3,380	2,100	815	645
3	195	225	166	72	72	88	31	468	3,380	2,010	755	618
4	180	225	180	72	72	88	31	405	3,480	1,840	755	645
5	195	225	166	72	79	88	31	445	3,480	1,760	755	618
6	195	225	166	72	.....	96	36	468	3,380	1,600	755	618
7	180	225	166	72	.....	96	40	468	3,180	1,600	815	a 522
8	195	210	152	72	.....	116	51	468	3,080	1,520	815	425
9	195	225	166	64	.....	116	64	468	3,080	1,520	755	405
10	166	210	166	64	.....	116	79	405	2,980	1,440	700	386
11	180	210	139	64	.....	116	106	425	2,980	1,440	645	425
12	166	225	139	64	.....	116	128	425	2,980	1,440	700	367
13	180	225	139	64	.....	139	139	468	2,880	1,360	700	367
14	166	257	139	72	.....	139	152	490	2,780	1,200	645	a 349
15	195	241	128	72	.....	139	210	540	2,680	1,200	700	331
16	195	241	139	72	.....	139	225	565	2,480	1,060	700	349
17	195	257	139	64	.....	139	241	618	2,190	1,060	645	331
18	195	241	139	64	.....	152	274	700	2,100	995	700	331
19	225	257	128	64	.....	152	309	700	1,920	875	645	331
20	225	257	128	72	.....	152	346	700	1,840	875	645	331
21	241	225	116	72	79	139	309	700	1,840	815	645	a 314
22	225	225	116	72	79	116	309	700	1,760	815	618	296
23	257	225	116	64	79	116	274	700	1,840	815	618	280
24	241	225	116	64	79	116	274	755	1,760	875	645	280
25	257	210	116	64	79	96	274	815	1,760	875	618	280
26	241	225	106	64	88	79	274	1,200	1,840	875	645	263
27	225	195	96	64	88	64	309	1,600	1,920	875	618	232
28	257	195	96	64	88	51	309	2,190	2,010	875	645	232
29	241	195	96	72	.....	51	327	2,680	2,100	875	618	232
30	257	180	88	72	.....	46	365	2,980	2,100	875	618	232
31	241	.....	88	72	.....	40	.....	3,080	.....	875	590	.....

a Interpolated.

NOTE.—Daily discharge Oct. 1, 1912, to Sept. 10, 1913, computed from a well-defined rating curve. Discharge Sept. 11–30, 1913, computed from a rating curve based on a discharge measurement made Dec. 19, 1913. Discharge Feb. 6–20, estimated on account of ice, 75 second-feet. Estimates for October and November differ from those published in Water-Supply Paper 325 because of revision of rating curve for stages below 2.0 feet.

Monthly discharge of St. Mary River near Babb, Mont., for the year ending Sept. 30, 1913.

[Drainage area, 177 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
October a	257	166	211	1.19	1.37	13,000	A.
November a	257	180	225	1.27	1.42	13,400	A.
December a	195	88	135	.763	.88	8,300	B.
January	79	64	68.8	.389	.45	4,230	C.
February	.....	.....	76.8	.434	.45	4,270	C.
March	152	40	106	.599	.69	6,520	C.
April	365	31	187	1.06	1.18	11,100	B.
May	3,080	385	885	5.00	5.76	54,400	A.
June	3,480	1,760	2,540	14.4	16.07	151,000	A.
July	2,280	815	1,250	7.06	8.14	76,900	A.
August	815	590	688	3.89	4.48	42,300	A.
September	645	232	389	2.20	2.46	23,100	B.
The year	3,480	31	564	3.19	43.35	409,000	

a Estimates differ from those published in Water-Supply Paper 325 because of revision of rating curve for stages below 2.0 feet.

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ST. MARY RIVER BELOW SWIFTCURRENT CREEK AT BABB, MONT.[1]

Location.—At Babb, Mont., about 1 mile below mouth of Swiftcurrent Creek.

Records available.—July 14, 1901, to October 18, 1902; May 13, 1910, to September 30, 1913.

Drainage area.—298 square miles.

Gage.—Chain gage installed July 19, 1911, on right bank about 100 feet farther downstream than staff gage installed on left bank May 13, 1910, and at a different datum. The original gage, which was used in 1901 and 1902, was a staff nailed to a pier of the highway bridge at Babb; it was destroyed by the flood of June 5, 1908. The gage installed May 13, 1910, was on the left bank about 75 feet below the old site and at a different datum. A temporary chain gage was also installed for low-water readings. On May 1, 1912, a gage was established on an overflow channel from Swiftcurrent Creek and gage readings obtained from May 2 to November 24. This overflow discharges into St. Mary River below the gage.

Channel and control.—Likely to change.

Discharge measurements.—In 1901 and 1902 made from highway bridge; in 1910 from a footbridge 100 feet above gage; in 1911 from a cable 50 feet above gage. Low-water measurements are made by wading. The overflow from Swiftcurrent Creek is measured from a footbridge.

Floods.—Probably the highest stage was reached June 5, 1908. No records of this flood were obtained at this point.

Winter flow.—Discharge relation affected by ice.

Accuracy.—Rating curves for main stream and for Swiftcurrent Creek overflow well defined; records excellent except during winter months.

Discharge measurements of St. Mary River below Swiftcurrent Creek at Babb, Mont., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 16	W. A. Lamb	3.89	177	June 27	W. A. Lamb	7.12	2,720
Mar. 30	do	3.65	111	July 31	do	5.72	1,120
May 18	do	5.40	971	Aug. 21	do	5.27	866
June 12	R. R. Randell	7.96	4,030	Sept. 14	do	4.67	424

NOTE.—Measurements do not include flow from Swiftcurrent Creek.

Discharge measurements of Swiftcurrent Creek overflow at Babb, Mont., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 16	W. A. Lamb	4.4	[b] 2.0	June 27	W. A. Lamb	6.15	88
Mar. 30	do	.....	(c)	July 31	do	5.18	21
May 18	do	6.3	108	Aug. 21	do	4.91	10
June 12	R. R. Randell	7.0	170	Sept. 14	do	4.6	4

[b] Estimated.

[c] No flow in the overflow channel.

[1] The records at this station for 1901 and 1902 were published in Water-Supply Paper 66 as for "St. Mary River at Main, Mont."

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Daily gage height, in feet, of St. Mary River below Swiftcurrent Creek at Babb, Mont., for the year ending Sept. 30, 1913.

[Carl Giruin, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4.25	4.3	4.2	3.7	3.4	3.6	3.6	4.9	8.25	7.2	5.65	5.15
2	4.2	4.3	4.2	3.65	3.4	3.55	3.6	4.9	8.35	7.15	5.65	5.1
3	4.2	4.3	4.2	3.65	3.5	3.65	3.6	4.9	8.35	7.0	5.65	5.1
4	4.2	4.3	4.15	3.65	3.6	3.65	3.6	4.95	8.15	6.8	5.65	5.15
5	4.2	4.3	4.15	3.65	3.6	3.7	3.55	4.8	8.15	6.65	5.7	5.15
6	4.15	4.25	4.15	3.65	3.7	3.7	3.5	4.85	8.15	6.7	5.65	5.0
7	4.15	4.25	4.05	3.65	3.7	3.65	3.55	4.85	7.95	6.7	5.55	5.05
8	4.2	4.2	4.05	3.65	3.9	3.75	3.6	4.8	7.95	6.65	5.6	5.0
9	4.15	4.2	4.05	3.6	3.95	3.75	3.6	4.8	7.9	6.6	5.7	5.05
10	4.1	4.2	4.05	3.6	3.9	3.75	3.7	4.65	8.05	6.55	5.8	4.75
11	4.05	4.2	4.05	3.6	3.95	3.75	3.7	4.7	8.1	6.6	5.75	4.6
12	4.05	4.25	3.95	3.6	4.0	3.75	3.8	4.8	8.0	6.5	5.75	4.65
13	4.1	4.3	3.95	3.65	4.0	3.8	3.9	4.9	7.9	6.45	5.85	4.75
14	4.05	4.35	3.95	3.65	4.1	3.85	4.0	5.1	7.85	6.3	5.6	4.8
15	4.15	4.35	3.85	3.65	4.15	3.85	4.4	5.0	7.8	6.15	5.7	4.8
16	4.2	4.35	3.85	3.65	4.25	3.85	4.55	5.1	7.55	6.0	5.6	4.7
17	4.25	4.4	3.85	3.6	4.2	3.8	4.9	5.3	7.4	5.85	5.75	4.7
18	4.3	4.35	3.85	3.6	4.1	3.9	5.4	5.5	7.4	5.9	5.5	4.7
19	4.4	4.35	3.8	3.6	4.0	3.95	5.7	5.5	7.15	5.85	5.4	4.6
20	4.35	4.35	3.8	3.6	3.85	3.95	5.6	5.5	7.1	5.8	5.35	4.6
21	4.35	4.3	3.8	3.65	3.9	4.0	5.45	5.6	7.1	5.85	5.25	4.6
22	4.4	4.3	3.8	3.5	3.8	3.95	5.3	5.7	6.95	5.85	5.3	4.6
23	4.4	4.3	3.8	3.5	3.7	3.9	5.4	5.8	6.9	5.85	5.25	4.6
24	4.4	4.3	3.8	3.45	5.7	3.9	*5.25	6.3	6.95	5.9	5.25	4.5
25	4.35	4.3	3.8	3.4	3.6	3.8	5.1	6.55	6.8	5.85	5.25	4.5
26	4.3	4.25	3.75	3.35	3.65	3.75	5.05	7.1	6.9	5.95	5.3	4.4
27	4.3	4.25	3.75	3.35	3.6	3.65	5.1	7.4	7.15	5.85	5.25	4.4
28	4.4	4.25	3.75	3.35	3.6	3.7	5.1	8.0	7.5	5.9	5.35	4.4
29	4.35	4.2	3.75	3.4	.....	3.7	5.0	8.25	7.45	5.9	5.3	4.4
30	4.35	4.2	3.7	3.4	.....	3.65	4.9	8.2	7.2	5.9	5.25	4.3
31	4.35	.....	3.7	3.4	.....	3.65	.....	8.4	.....	5.65	5.1	.....

NOTE.—Discharge relation probably affected by ice about Feb. 6–24, 1913.

Daily discharge, in second-feet, of St. Mary River below Swiftcurrent Creek at Babb, Mont., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	324	347	307	122	46	95	95	657	4,200	2,790	1,120	730
2	302	347	307	108	46	82	95	657	4,340	2,720	1,120	696
3	302	347	307	108	70	108	95	657	4,340	2,530	1,120	696
4	302	347	285	108	95	108	95	689	4,060	2,280	1,120	730
5	302	347	285	108	95	122	82	595	4,060	2,100	1,160	730
6	281	324	285	108	.....	122	70	626	4,060	2,160	1,120	630
7	281	324	242	108	.....	108	82	626	3,780	2,160	1,040	663
8	302	302	242	108	.....	137	95	595	3,780	2,100	1,080	630
9	281	302	242	95	.....	137	95	595	3,710	2,040	1,160	663
10	260	302	242	95	.....	137	122	508	3,920	1,980	1,250	481
11	240	302	242	95	.....	137	122	536	3,990	2,040	1,210	400
12	240	324	203	95	.....	137	152	595	3,850	1,930	1,210	426
13	260	347	203	108	.....	152	184	657	3,710	1,880	1,300	481
14	240	371	203	108	.....	168	218	787	3,640	1,720	1,080	509
15	281	371	167	108	.....	168	382	721	3,570	1,570	1,160	509
16	302	371	167	108	.....	168	456	787	3,240	1,430	1,080	453
17	324	395	167	95	.....	152	657	925	3,050	1,300	1,210	453
18	347	371	167	95	.....	184	995	1,070	3,050	1,340	995	453
19	395	371	150	95	.....	201	1,230	1,070	2,720	1,300	914	400
20	371	371	150	95	.....	201	1,150	1,070	2,660	1,250	876	400
21	371	347	150	108	.....	218	1,030	1,150	2,660	1,300	802	400
22	395	347	150	70	.....	201	925	1,230	2,470	1,300	838	400
23	395	347	150	70	.....	184	995	1,310	2,410	1,300	802	400
24	395	347	150	58	.....	184	890	1,750	2,470	1,340	802	350
25	371	356	150	46	95	152	787	2,020	2,290	1,300	802	350
26	347	332	134	35	108	137	754	2,660	2,410	1,380	838	303
27	347	332	134	35	95	108	787	3,050	2,720	1,300	802	303
28	395	332	134	35	95	122	787	3,850	3,180	1,340	876	303
29	371	307	134	46	.....	122	721	4,200	3,120	1,340	838	303
30	371	307	118	46	.....	108	657	4,130	2,790	1,340	802	260
31	371	.....	118	46	.....	108	.....	4,410	.....	1,120	696	.....

NOTE.—Daily discharge computed as follows: Previous to Nov. 25 and after Dec. 31, 1912, from well-defined rating curves based on discharge measurements that do not include the flow in the Swiftcurrent overflow channel; Nov. 25 to Dec 31, 1912, from a well-defined rating curve based on measurements that include the flow in Swiftcurrent overflow channel. Discharge Feb. 6–24, 1913, estimated, because of ice, from gage heights and climatic records, at 150 second-feet.

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Daily gage height, in feet, of Swiftcurrent Creek overflow at Babb, Mont., for the year ending Sept. 30, 1913.

[O. S. Main, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4.9	5.0	.....	.....	.....	.....	.....	5.8	7.4	6.4	5.1	4.7
2	4.9	4.95	.....	.....	.....	.....	.....	5.8	7.3	6.2	5.1	4.7
3	4.9	4.95	.....	.....	.....	.....	.....	5.8	7.4	6.0	5.15	4.7
4	4.85	4.9	.....	.....	.....	.....	.....	5.85	7.3	5.9	5.2	4.7
5	4.85	4.85	.....	.....	.....	.....	.....	5.8	7.2	5.8	5.2	4.7
6	4.8	4.8	.....	.....	.....	.....	.....	5.8	7.2	5.65	5.2	4.7
7	4.8	4.7	.....	.....	.....	.....	.....	5.75	7.0	5.6	5.25	4.7
8	4.8	4.7	.....	.....	.....	.....	.....	5.7	7.0	5.6	5.3	4.6
9	4.8	4.65	.....	.....	.....	.....	.....	5.6	7.1	5.5	5.35	4.6
10	4.75	4.6	.....	.....	.....	.....	.....	5.6	6.9	5.55	5.4	4.6
11	4.75	4.7	.....	.....	.....	.....	.....	5.6	6.9	5.6	5.3	4.6
12	4.75	4.8	.....	.....	.....	.....	.....	5.8	7.0	5.5	5.4	4.6
13	4.75	4.9	.....	.....	.....	.....	4.8	5.9	6.9	5.45	5.1	4.6
14	4.8	5.0	.....	.....	.....	.....	5.0	6.1	6.85	5.4	5.3	4.3
15	4.9	5.1	.....	.....	.....	.....	5.4	6.2	6.5	5.35	5.3	4.4
16	5.0	5.2	.....	.....	.....	.....	5.8	6.25	6.5	5.2	5.4	4.5
17	5.1	5.25	.....	.....	.....	.....	5.9	6.3	6.4	5.2	5.45	4.6
18	5.2	5.25	.....	.....	.....	.....	6.0	6.4	6.35	5.1	5.5	4.7
19	5.3	5.25	.....	.....	.....	.....	6.2	6.5	6.3	4.9	5.4	4.7
20	5.3	5.25	.....	.....	.....	.....	6.3	6.5	6.4	4.85	5.3	4.7
21	5.3	5.25	.....	.....	.....	.....	6.3	6.5	6.45	4.8	5.2	4.7
22	5.25	5.25	.....	.....	.....	.....	6.0	6.7	6.4	4.8	5.3	4.7
23	5.25	5.1	.....	.....	.....	.....	6.0	6.9	6.2	4.75	5.4	4.8
24	5.2	5.0	.....	.....	.....	.....	5.9	7.0	6.25	4.7	5.3	4.8
25	5.2	.....	.....	.....	.....	.....	5.9	7.1	6.2	4.75	5.3	4.9
26	5.1	.....	.....	.....	.....	.....	6.0	7.2	6.05	4.8	5.4	4.9
27	5.1	.....	.....	.....	.....	.....	6.0	7.5	6.3	4.85	5.3	4.9
28	5.1	.....	.....	.....	.....	.....	5.95	7.4	6.7	5.1	5.2	4.6
29	5.1	.....	.....	.....	.....	.....	5.9	7.4	6.5	5.15	5.3	4.7
30	5.1	.....	.....	.....	.....	.....	5.85	7.4	6.5	5.3	5.2	4.7
31	5.0	.....	.....	.....	.....	.....	.....	7.3	.....	5.25	4.8	.....

Daily discharge, in second-feet, of Swiftcurrent Creek overflow at Babb, Mont., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	10	14	.....	.....	.....	.....	.....	66	214	116	18	6.0
2	10	12	.....	.....	.....	.....	.....	66	204	98	18	6.0
3	10	12	.....	.....	.....	.....	.....	66	214	82	20	6.0
4	9.2	10	.....	.....	.....	.....	.....	70	204	74	22	6.0
5	9.2	9.2	.....	.....	.....	.....	.....	66	194	66	22	6.0
6	8.0	8.0	.....	.....	.....	.....	.....	66	194	54	22	6.0
7	8.0	6.0	.....	.....	.....	.....	.....	62	174	50	25	6.0
8	8.0	6.0	.....	.....	.....	.....	.....	58	174	50	28	4.4
9	8.0	5.2	.....	.....	.....	.....	.....	50	184	42	32	4.4
10	7.0	4.4	.....	.....	.....	.....	.....	50	164	46	35	4.4
11	7.0	6.0	.....	.....	.....	.....	.....	50	164	50	28	4.4
12	7.0	8.0	.....	.....	.....	.....	.....	66	174	42	35	4.4
13	7.0	10	.....	.....	.....	.....	8.0	74	164	39	18	4.4
14	8.0	14	.....	.....	.....	.....	14	90	159	35	28	1.5
15	10	18	.....	.....	.....	.....	35	98	125	32	28	2.2
16	14	22	.....	.....	.....	.....	66	102	125	22	35	3.2
17	18	25	.....	.....	.....	.....	74	107	116	22	39	4.4
18	22	25	.....	.....	.....	.....	82	116	112	18	42	6.0
19	28	25	.....	.....	.....	.....	98	125	107	10	35	6.0
20	28	25	.....	.....	.....	.....	107	125	116	9.2	28	6.0
21	28	25	.....	.....	.....	.....	107	125	120	8.0	22	6.0
22	25	25	.....	.....	.....	.....	82	144	116	8.0	28	6.0
23	25	18	.....	.....	.....	.....	82	164	98	7.0	35	8.0
24	22	14	.....	.....	.....	.....	74	174	102	6.0	28	8.0
25	22	.....	.....	.....	.....	.....	74	184	98	7.0	28	10
26	18	.....	.....	.....	.....	.....	82	194	86	8.0	35	10
27	18	.....	.....	.....	.....	.....	82	224	107	9.2	28	10
28	18	.....	.....	.....	.....	.....	78	214	144	18	22	4.4
29	18	.....	.....	.....	.....	.....	74	214	125	20	28	6.0
30	18	.....	.....	.....	.....	.....	70	214	125	28	22	6.0
31	14	.....	.....	.....	.....	.....	.....	204	.....	25	8.0	.....

NOTE.—Daily discharge computed from a rating curve well defined above 28 second-feet (gage height 3.3 feet) and fairly well defined below that point.

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Combined daily discharge, in second-feet, of St. Mary River and Swiftcurrent Creek overflow at Babb, Mont., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	334	361	307	122	46	95	95	723	4,410	2,910	1,140	736
2	312	359	307	108	46	82	95	723	4,540	2,820	1,140	702
3	312	359	307	108	70	108	95	723	4,550	2,610	1,140	702
4	311	357	285	108	95	108	95	759	4,260	2,350	1,140	736
5	311	356	285	108	95	122	82	661	4,250	2,170	1,180	736
6	289	332	285	108	(a)	122	70	692	4,250	2,210	1,140	636
7	289	330	242	108	(a)	108	82	688	3,950	2,210	1,060	669
8	310	308	242	108	(a)	137	95	653	3,950	2,150	1,110	634
9	289	307	242	95	(a)	137	95	645	3,890	2,080	1,190	667
10	267	306	242	95	(a)	137	122	558	4,080	2,030	1,280	485
11	247	308	242	95	(a)	137	122	586	4,150	2,090	1,240	404
12	247	332	203	95	(a)	137	152	661	4,020	1,970	1,240	430
13	267	357	203	108	(a)	152	192	731	3,870	1,920	1,320	485
14	248	385	203	108	(a)	168	232	877	3,800	1,760	1,110	510
15	291	389	167	108	(a)	168	417	819	3,700	1,600	1,190	511
16	316	393	167	108	(a)	168	522	889	3,360	1,450	1,120	456
17	342	420	167	95	(a)	152	731	1,030	3,170	1,320	1,250	457
18	369	396	167	95	(a)	184	1,080	1,190	3,160	1,360	1,040	459
19	423	396	150	95	(a)	201	1,330	1,200	2,830	1,310	949	406
20	399	396	150	95	(a)	201	1,260	1,200	2,780	1,260	904	406
21	399	372	150	108	(a)	218	1,140	1,280	2,780	1,310	824	406
22	420	372	150	70	(a)	201	1,010	1,370	2,590	1,310	866	406
23	420	365	150	70	(a)	184	1,080	1,470	2,510	1,310	837	408
24	417	361	150	58	(a)	184	964	1,920	2,570	1,350	830	358
25	393	356	150	46	95	152	861	2,200	2,390	1,310	830	360
26	365	332	134	35	108	137	836	2,850	2,500	1,390	873	313
27	365	332	134	35	95	108	869	3,270	2,830	1,310	830	313
28	413	332	134	35	95	122	865	4,060	3,320	1,360	898	307
29	389	307	134	46	.....	122	795	4,410	3,240	1,360	866	309
30	389	307	118	46	.....	108	727	4,340	2,920	1,370	824	266
31	385	.....	118	46	.....	108	.....	4,610	.....	1,140	704	.....

a Mean discharge Feb. 6–24 estimated 150 second-feet; see footnote to table of daily discharge for Swiftcurrent Creek.

Monthly discharge of St. Mary River and Swiftcurrent Creek overflow at Babb, Mont., for the year ending Sept. 30, 1913.

[Drainage area, 298 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
October	423	247	340	1.14	1.31	20,900	A.
November	420	306	353	1.18	1.32	21,000	B.
December	307	118	196	.658	.76	12,100	B.
January	122	35	86.0	.289	.33	5,290	C.
February	.....	.....	128	.430	.45	7,110	C.
March	218	82	144	.483	.56	8,850	B.
April	1,330	70	537	1.80	2.01	32,000	B.
May	4,610	558	1,540	5.17	5.96	94,700	A.
June	4,550	2,390	3,490	11.7	13.05	208,000	A.
July	2,910	1,140	1,750	5.87	6.77	108,000	B.
August	1,320	704	1,030	3.46	3.99	63,300	B.
September	736	266	489	1.64	1.83	29,100	B.
The year	4,610	.....	842	2.83	38.34	610,000	

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ST. MARY RIVER NEAR KIMBALL, ALBERTA.

Location.—In the SW. ¼ sec. 25, T. 1, R. 25 W. fourth meridian, about 1 mile above the dam and headgate of the Alberta Railway & Irrigation Co., and about 1 mile southwest of Kimball.

Records available.—January 1 to September 30, 1913. Records were obtained at Cook's ranch (St. Mary River near Cardston), about half a mile north of the boundary line and about 5 miles above this station, from September 4, 1902, to December 31, 1912. Records were also obtained by the Irrigation Branch, Department of the Interior, Canada, at a point about 3,000 feet below the present station, from 1905 to 1912. The flow at the three points is practically the same.

Drainage area.—472 square miles at present station; 452 square miles at Cook's ranch.

Gage.—Friez water stage register. Winter records are obtained from the staff gage at the Canadian station about 3,000 feet downstream.

Channel and control.—Shifting.

Discharge measurements.—Made from cable about 3,000 feet downstream or by wading.

Diversions.—None above gage.

Winter flow.—Affected by ice.

Accuracy.—Estimates reliable.

Cooperation.—Station maintained jointly with the Irrigation Office, Department of the Interior, Canada, during 1913.

Discharge measurements of St. Mary River at Kimball, Alberta, during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 13	V. Meek	[a] 3.16	180	June 13	R. R. Randell	5.74	4,750
24	do	2.76	94	13	W. A. Burton	5.78	4,979
Feb. 6	G. F. Deas	2.70	100	27	F. R. Burfield	5.45	3,993
24	do	2.82	141	July 4	do	4.93	3,044
Mar. 11	do	2.95	220	21	do	3.66	1,354
Apr. 25	do	[a] 3.35	1,028	28	W. A. Lamb	3.71	1,450
May 4	F. R. Burfield	[b] 2.65	949	Aug. 7	F. R. Burfield	3.56	1,283
19	W. A. Lamb	3.45	1,590	20	W. A. Lamb	3.28	1,060
24	F. R. Burfield	3.96	2,260	28	F. R. Burfield	3.04	855
26	do	4.58	3,042	Sept. 13	W. A. Lamb	2.55	550
June 5	do	6.05	5,209	24	L. Danielson	[b] 2.35	468
9	do	5.76	5,007				

[a] Gage heights Jan. 13 to Apr. 25 refer to staff gage at the cable.
[b] Gage heights May 4 to Sept. 24 refer to the automatic gage.

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Daily gage height, in feet, of St. Mary River at Kimball, Alberta, for the year ending Sept. 30, 1913.

[J. M. Dunn, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3.00	2.45	2.55	2.36	2.76	6.05	5.29	3.54	2.98
2	3.00	2.65	2.55	2.37	2.74	6.09	5.24	3.53	2.98
3	3.00	2.85	2.55	2.38	2.70	6.07	5.12	3.59	2.93
4	3.00	2.85	2.65	2.38	2.68	6.06	4.94	3.60	2.94
5	3.20	2.70	2.70	2.43	2.65	6.01	4.81	3.59	2.86
6	3.40	2.70	2.75	2.53	2.62	5.99	4.71	3.57	2.86
7	3.30	2.80	2.80	2.63	2.60	5.81	4.65	3.55	2.74
8	3.35	2.90	2.95	2.64	2.62	5.83	4.58	3.64	2.70
9	3.40	2.80	2.95	2.94	2.64	5.82	4.53	3.82	2.60
10	3.43	2.82	2.95	3.06	2.57	5.86	4.47	3.96	2.56
11	3.50	2.82	2.95	3.19	2.71	5.98	4.47	3.86	2.46
12	3.55	2.85	2.87	3.19	2.89	6.07	4.45	3.78	2.38
13	3.45	2.85	2.80	3.54	3.02	5.89	4.37	3.72	2.37
14	3.60	2.90	2.80	3.04	3.09	5.79	4.24	3.69	2.34
15	3.60	3.00	2.85	2.05	3.09	5.67	4.06	3.65	2.35
16	2.90	3.00	2.90	1.65	3.18	5.55	3.91	3.53	2.40
17	1.98	3.00	2.90	3.45	3.24	5.56	3.78	3.45	2.43
18	1.90	3.00	2.86	3.50	3.37	5.55	3.70	3.40	2.47
19	2.00	3.00	2.91	3.50	3.45	5.56	3.65	3.33	2.50
20	2.06	3.00	2.81	3.55	3.33	5.56	3.62	3.24	2.53
21	2.00	2.95	2.81	2.99	3.30	5.43	3.65	3.18	2.49
22	2.30	2.95	2.79	2.98	3.42	5.02	3.68	3.11	2.51
23	2.90	2.95	2.68	2.86	3.71	4.97	3.67	3.07	2.47
24	2.76	2.82	2.62	2.84	4.00	4.90	3.65	3.03	2.36
25	3.00	2.70	2.57	2.90	4.32	4.92	3.69	3.02	2.37
26	2.30	2.70	2.57	2.90	4.66	5.12	3.89	3.04	2.26
27	2.00	2.65	2.57	2.96	5.15	5.42	3.84	3.02	2.20
28	1.95	2.63	2.42	2.93	5.17	5.65	3.75	3.02	2.20
29	2.30	.....	2.32	2.87	5.92	5.58	3.70	3.01	2.18
30	2.40	.....	2.32	2.81	6.01	5.41	3.71	3.00	2.19
31	2.45	.....	2.35	.....	6.00	.....	3.62	3.00	.....

NOTE.—Gage heights Jan. 1 to Apr. 20 read on staff gage at cable. Discharge relation was affected by ice Jan. 1 to Apr. 16.

Daily discharge, in second-feet, of St. Mary River at Kimball, Alberta, for the year ending Sept. 30, 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	202	115	135	238	1,020	5,320	3,620	1,270	816
2	199	110	137	250	1,004	5,380	3,530	1,260	816
3	196	106	148	263	980	5,350	3,340	1,310	781
4	193	103	160	277	968	5,340	3,060	1,320	788
5	190	102	172	293	950	5,260	2,860	1,310	732
6	187	101	186	309	932	5,220	2,710	1,290	732
7	184	102	200	324	920	4,940	2,620	1,270	654
8	183	108	210	343	932	4,970	2,520	1,360	630
9	185	115	216	365	944	4,950	2,450	1,530	570
10	187	121	218	392	902	5,020	2,360	1,690	550
11	187	127	219	418	986	5,210	2,360	1,580	500
12	183	132	219	450	1,100	5,350	2,330	1,490	461
13	180	137	218	500	1,210	5,060	2,220	1,430	456
14	181	140	216	580	1,260	4,800	2,040	1,400	443
15	188	142	209	700	1,260	4,600	1,810	1,360	448
16	182	145	198	910	1,340	4,400	1,630	1,260	470
17	172	146	191	1,120	1,400	4,380	1,490	1,180	485
18	160	145	188	1,180	1,520	4,340	1,410	1,140	505
19	140	145	187	1,180	1,600	4,330	1,360	1,080	520
20	123	143	185	1,240	1,480	4,310	1,340	1,010	535
21	109	142	183	1,180	1,450	4,090	1,360	964	515
22	101	141	180	1,170	1,570	3,460	1,390	908	525
23	96	140	178	1,080	1,900	3,360	1,380	879	505
24	95	140	177	1,070	2,270	3,240	1,360	851	452
25	99	140	177	1,110	2,720	3,240	1,400	844	456
26	128	139	180	1,110	3,190	3,520	1,610	858	407
27	138	137	187	1,160	3,920	3,950	1,550	844	380
28	137	136	196	1,130	3,950	4,250	1,460	844	380
29	132	.....	205	1,090	5,110	4,110	1,410	837	372
30	127	.....	215	1,050	5,260	3,820	1,420	830	376
31	121	.....	226	.....	5,240	.....	1,340	830	.....

NOTE.—Discharge determined as follows: Jan. 1 to Apr. 16, estimated from current-meter measurements; Apr. 17-20, from rating curve for staff gage; Apr. 21 to June 13 and July 15 to Sept. 30, from two well-defined rating curves; June 14 to July 14, by indirect methods for shifting channel.

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Monthly discharge of St. Mary River at Kimball, Alberta, for the year ending Sept. 30, 1913.

[Drainage area, 472 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	mean.	Per square mile.	
January	202	95	158	0.335	0.386
February	146	101	129	.273	.284
March	226	135	191	.405	.467
April	1,240	238	749	1.587	1.771
May	5,260	902	1,912	4.051	4.671
June	5,380	3,240	4,519	9.574	10.681
July	3,620	1,340	2,024	4.288	4.944
August	1,690	830	1,162	2.462	2.838
September	816	372	542	1.148	1.281

SWIFTCURRENT CREEK AT McDERMOTT LAKE, MONT.

Location.—In sec. 12, T. 35 N., R. 16 W., at outlet of McDermott Lake, about 14 miles southwest of Babb, Mont.

Records available.—June 6, 1912, to September 30, 1913.

Drainage area.—31.4 square miles.

Gage.—Vertical staff attached to post on left bank at the lake outlet.

Channel and control.—Channel practically permanent. The control is a limestone reef at the lake outlet.

Discharge measurements.—Made by wading or from a cable across the outlet.

Winter flow.—Station not maintained during winter. Ice exists at the gage, but control section probably remains unobstructed.

Accuracy.—Rating curve for the year ending September 30, 1913, well defined below 700 second-feet. At gage height 3.0 feet the revised rating curve gives discharges about 10 per cent less than those published in Water-Supply Paper 325. Estimates for June and July, 1912, for stages above 2.5 feet should be therefore revised by persons having occasion to use them. Gage heights during low water may be affected by action of wind on the lake and therefore may not represent the mean flow for the day.

Discharge measurements of Swiftcurrent Creek at McDermott Lake, Mont., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 15	W. A. Lamb	1.39	[a] 26	July 30	W. A. Lamb	2.39	227
Apr. 1	do		[b] 8.7	Aug. 22	Lamb and Hoyt	2.13	122
June 26	do	2.93	456				

[a] Ice at gage and along shores; control not obstructed; measurement made by wading.
[b] Discharge relation affected by ice.

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Daily gage height, in feet, of Swiftcurrent Creek at McDermott Lake, Mont., for the year ending Sept. 30, 1913.

[G. L. Roberts and F. M. Stevenson, observers.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.8	1.8	.....	.....	.....	.....	.....	.....	3.6	3.35	.....	2.15
2	1.8	1.8	.....	.....	.....	.....	.....	.....	3.65	3.25	.....	.....
3	1.8	1.8	.....	.....	.....	.....	.....	.....	3.5	3.05	2.35	2.15
4	1.8	1.8	.....	.....	.....	.....	.....	.....	3.5	3.0	.....	.....
5	1.8	1.8	.....	.....	.....	.....	.....	.....	3.55	2.95	2.35	.....
6	1.8	1.8	.....	.....	.....	.....	.....	.....	3.5	.....	.....	2.15
7	1.8	1.8	.....	.....	.....	.....	.....	.....	3.5	.....	2.4	.....
8	1.8	1.8	.....	.....	.....	.....	.....	.....	3.6	.....	.....	.....
9	1.9	.....	.....	.....	.....	.....	.....	.....	3.5	.....	2.45	.....
10	1.9	.....	.....	.....	.....	.....	.....	.....	3.5	.....	.....	.....
11	1.8	.....	.....	.....	.....	.....	.....	.....	3.6	.....	2.35	.....
12	1.8	.....	.....	.....	.....	.....	.....	.....	3.5	.....	.....	.....
13	1.8	.....	.....	.....	.....	.....	.....	.....	3.5	.....	2.4	.....
14	1.8	.....	.....	.....	.....	.....	.....	.....	3.5	.....	.....	.....
15	1.8	.....	.....	.....	.....	.....	.....	.....	3.45	.....	2.4	2.05
16	1.8	.....	.....	.....	.....	.....	.....	1.9	3.45	.....	.....	.....
17	1.8	.....	.....	.....	.....	.....	.....	2.0	3.35	.....	2.35	.....
18	1.8	.....	.....	.....	.....	.....	.....	2.3	3.35	.....	.....	2.05
19	1.8	.....	.....	.....	.....	.....	.....	2.3	3.2	.....	2.3	.....
20	1.8	.....	.....	.....	.....	.....	.....	2.45	3.35	.....	.....	1.95
21	1.8	.....	.....	.....	.....	.....	.....	2.4	3.25	.....	2.2	.....
22	1.8	.....	.....	.....	.....	.....	.....	2.6	3.15	.....	.....	1.95
23	1.8	.....	.....	.....	.....	.....	.....	2.85	3.05	.....	.....	.....
24	1.8	.....	.....	.....	.....	.....	.....	3.1	3.0	.....	2.2	2.0
25	1.8	.....	.....	.....	.....	.....	.....	3.3	2.95	.....	.....	.....
26	1.8	.....	.....	.....	.....	.....	.....	3.75	2.95	.....	2.2	1.85
27	.....	.....	.....	.....	.....	.....	.....	4.0	3.05	.....	.....	.....
28	.....	.....	.....	.....	.....	.....	.....	4.25	3.55	.....	.....	.....
29	.....	.....	.....	.....	.....	.....	.....	3.8	3.5	.....	2.2	1.85
30	.....	.....	.....	.....	.....	.....	.....	3.7	3.45	.....	.....	.....
31	.....	.....	.....	.....	.....	.....	.....	3.75	.....	.....	.....	.....

Daily discharge, in second-feet, of Swiftcurrent Creek at McDermott Lake, Mont., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	68	68	.....	.....	.....	.....	.....	.....	796	668	206	141
2	68	68	.....	.....	.....	.....	.....	.....	822	618	206	141
3	68	68	.....	.....	.....	.....	.....	.....	744	520	206	141
4	68	68	.....	.....	.....	.....	.....	.....	744	496	206	141
5	68	68	.....	.....	.....	.....	.....	.....	770	472	206	141
6	68	68	.....	.....	.....	.....	.....	.....	744	.....	216	141
7	68	68	.....	.....	.....	.....	.....	.....	744	.....	225	138
8	68	68	.....	.....	.....	.....	.....	.....	796	.....	236	135
9	84	.....	.....	.....	.....	.....	.....	.....	744	.....	246	132
10	84	.....	.....	.....	.....	.....	.....	.....	744	.....	226	128
11	68	.....	.....	.....	.....	.....	.....	.....	796	.....	206	125
12	68	.....	.....	.....	.....	.....	.....	.....	744	.....	216	123
13	68	.....	.....	.....	.....	.....	.....	.....	744	.....	225	119
14	68	.....	.....	.....	.....	.....	.....	.....	744	.....	225	117
15	68	.....	.....	.....	.....	.....	.....	.....	718	.....	225	115
16	68	.....	.....	.....	.....	.....	.....	84	718	.....	216	115
17	68	.....	.....	.....	.....	.....	.....	103	668	.....	206	115
18	68	.....	.....	.....	.....	.....	.....	188	668	.....	197	115
19	68	.....	.....	.....	.....	.....	.....	188	593	.....	188	104
20	68	.....	.....	.....	.....	.....	.....	246	668	.....	172	94
21	68	.....	.....	.....	.....	.....	.....	225	618	.....	155	94
22	68	.....	.....	.....	.....	.....	.....	309	568	.....	155	94
23	68	.....	.....	.....	.....	.....	.....	424	520	.....	155	98
24	68	.....	.....	.....	.....	.....	.....	544	496	.....	155	103
25	68	.....	.....	.....	.....	.....	.....	643	472	.....	155	90
26	68	.....	.....	.....	.....	.....	.....	874	472	.....	155	76
27	68	.....	.....	.....	.....	.....	.....	1,010	520	.....	155	76
28	68	.....	.....	.....	.....	.....	.....	1,150	770	.....	155	76
29	68	.....	.....	.....	.....	.....	.....	901	744	.....	155	76
30	68	.....	.....	.....	.....	.....	.....	848	718	.....	150	76
31	68	.....	.....	.....	.....	.....	.....	874	.....	.....	146	.....

NOTE.—Daily discharge computed from a rating curve well defined between 21 and 693 second-feet (gage heights 1.3 and 3.4 feet). Discharge interpolated for days on which gage was not read. Discharge July 6–31, 1913, estimated, by comparison with records of Swiftcurrent Creek at Sherburne Lake, at 270 second-feet.

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Monthly discharge of Swiftcurrent Creek at McDermott Lake, Mont., for the year ending Sept. 30, 1913.

[Drainage area, 31.4 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
October	84	68	69.0	2.20	2.54	4,240	B.
November 1–8	68	68	68.0	2.17	.65	1,080	B.
May 16–31	1,150	84	538	17.1	10.18	17,100	B.
June	822	472	687	21.9	24.43	40,900	B.
July	.....	.....	316	10.1	11.64	19,400	B.
August	246	146	192	6.11	7.04	11,800	B.
September	141	76	113	3.60	4.02	6,720	B.

SWIFTCURRENT CREEK AT SHERBURNE LAKE, MONT.

Location.—In sec. 35, T. 36 N., R. 15 W., at outlet of lower Sherburne Lake, just above boundary line between Glacier National Park and Blackfeet Indian Reservation.

Records available.—July 1, 1912, to September 30, 1913.

Drainage area.—64.0 square miles.

Gage.—Vertical staff on left bank near the outlet of the lake.

Channel and control.—Apparently permanent.

Discharge measurements.—Made by wading or from a cable below the gage.

Winter flow.—Affected by ice.

Diversion.—None above the station.

Accuracy.—Accuracy of gage heights may be affected by wave action on the lake.

Discharge measurements of Swiftcurrent Creek, at Sherburne Lake, Mont., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 15	W. A. Lamb	2.53	[a]47	July 30	W. A. Lamb	3.98	340
June 11	R. R. Randell	6.38	1,180	Sept. 15	.....do	2.73	99
26	W. A. Lamb	5.06	642				

[a] Measurement made from ice.

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Daily gage height, in feet, of Swiftcurrent Creek at Sherburne Lake, Mont., for the year ending Sept. 30, 1913.

[F. M. Stevenson, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.44	2.39	2.30	.....	.....	.....	.....	3.2	7.1	.....	3.9	3.1
2	2.40	2.32	2.33	.....	.....	.....	.....	3.0	7.0	6.2	.....	.....
3	2.32	2.26	2.36	.....	.....	.....	.....	2.85	6.8	4.7	.....	3.1
4	2.35	2.20	2.40	.....	.....	.....	.....	2.8	6.7	.....	3.95	.....
5	2.36	2.26	2.5	.....	.....	.....	.....	2.7	6.6	4.5	.....	.....
6	2.40	2.28	2.6	.....	.....	.....	.....	2.7	6.5	.....	4.0	3.1
7	2.42	2.32	2.7	.....	.....	.....	.....	2.7	6.4	4.45	.....	.....
8	2.38	2.45	2.7	.....	.....	.....	.....	2.7	.....	.....	4.1	3.05
9	2.40	2.7	2.75	.....	.....	.....	.....	2.7	6.3	4.4	.....	.....
10	2.40	2.95	2.75	.....	.....	.....	.....	3.2	.....	.....	4.05	3.0
11	2.38	2.95	2.8	.....	.....	.....	.....	3.35	6.1	.....	.....	.....
12	2.36	2.8	.....	.....	.....	.....	.....	3.65	.....	4.5	4.0	.....
13	2.34	2.85	.....	.....	.....	.....	.....	3.85	6.0	.....	.....	2.95
14	2.26	2.8	.....	.....	.....	.....	.....	3.9	.....	4.4	4.0	.....
15	2.28	2.8	2.55	.....	.....	.....	.....	3.85	.....	.....	.....	2.9
16	2.39	2.7	.....	.....	.....	.....	.....	3.8	5.8	.....	4.0	.....
17	2.5	2.55	.....	.....	.....	.....	.....	3.6	.....	4.2	.....	2.65
18	2.85	2.44	.....	.....	.....	.....	.....	3.55	5.7	.....	3.9	.....
19	3.0	2.5	.....	.....	.....	.....	.....	3.45	.....	4.1	.....	.....
20	3.0	2.7	.....	.....	.....	.....	.....	3.35	5.7	.....	3.7	2.5
21	3.05	2.9	.....	.....	.....	.....	.....	3.45	.....	3.9	.....	.....
22	2.95	2.8	.....	.....	.....	.....	.....	3.75	.....	.....	3.35	2.55
23	3.05	2.6	.....	.....	.....	.....	.....	4.9	5.6	3.7	.....	.....
24	2.85	2.49	.....	.....	.....	.....	.....	5.4	.....	.....	3.2	.....
25	2.8	2.65	.....	.....	.....	.....	.....	6.0	5.6	.....	.....	2.6
26	2.6	2.55	.....	.....	.....	.....	.....	6.7	.....	3.6	.....	.....
27	2.55	2.41	.....	.....	.....	.....	.....	7.2	.....	.....	3.15	2.5
28	2.6	2.38	.....	.....	.....	.....	.....	7.8	6.5	3.7	.....	.....
29	2.7	2.32	.....	.....	.....	.....	.....	7.5	.....	.....	.....	2.5
30	2.6	2.28	.....	.....	.....	.....	.....	7.1	6.4	3.95	3.1	.....
31	2.55	.....	.....	.....	.....	.....	.....	7.0	.....	.....	.....	.....

Daily discharge, in second-feet, of Swiftcurrent Creek at Sherburne Lake, Mont., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	80	76	71	.....	.....	.....	.....	166	1,500	1,140	315	151
2	77	72	70	.....	.....	.....	.....	138	1,450	1,090	319	151
3	72	69	69	.....	.....	.....	.....	120	1,360	539	324	151
4	74	66	68	.....	.....	.....	.....	114	1,310	508	328	151
5	75	69	67	.....	.....	.....	.....	103	1,270	478	334	151
6	77	70	66	.....	.....	.....	.....	103	1,220	471	340	151
7	78	72	65	.....	.....	.....	.....	103	1,180	464	353	148
8	76	80	64	.....	.....	.....	.....	103	1,160	456	366	144
9	77	103	63	.....	.....	.....	.....	103	1,140	449	360	141
10	77	132	62	.....	.....	.....	.....	166	1,100	459	353	138
11	76	132	59	.....	.....	.....	.....	192	1,050	468	346	136
12	75	114	56	.....	.....	.....	.....	254	1,030	478	340	134
13	73	120	53	.....	.....	.....	.....	302	1,010	464	340	132
14	69	114	50	.....	.....	.....	.....	315	983	449	340	129
15	70	114	47	.....	.....	.....	.....	302	957	430	340	126
16	76	103	.....	.....	.....	.....	.....	290	930	412	340	112
17	84	88	.....	.....	.....	.....	.....	243	910	393	328	98
18	120	80	.....	.....	.....	.....	.....	232	891	380	315	93
19	138	84	.....	.....	.....	.....	.....	212	891	366	290	89
20	138	103	.....	.....	.....	.....	.....	192	891	340	266	84
21	144	126	.....	.....	.....	.....	.....	212	878	315	229	86
22	132	114	.....	.....	.....	.....	.....	278	866	290	192	88
23	144	93	.....	.....	.....	.....	.....	604	853	266	179	90
24	120	83	.....	.....	.....	.....	.....	779	853	258	166	91
25	114	98	.....	.....	.....	.....	.....	1,010	853	251	163	93
26	93	88	.....	.....	.....	.....	.....	1,310	975	243	161	88
27	88	78	.....	.....	.....	.....	.....	1,550	1,100	254	158	84
28	93	76	.....	.....	.....	.....	.....	1,850	1,220	266	156	84
29	103	72	.....	.....	.....	.....	.....	1,700	1,200	297	153	84
30	93	70	.....	.....	.....	.....	.....	1,500	1,180	328	151	84
31	88	.....	.....	.....	.....	.....	.....	1,450	.....	322	151	.....

NOTE.—Daily discharge computed from a rating curve well defined between 84 and 1,450 second-feet (gage heights, 2.5 and 7.0 feet).

Discharge interpolated for days on which gage was not read. Estimates for October, November, and December, 1912, differ from those published in Water-Supply Paper 325 because of revision of low-water section of the rating curve.

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Monthly discharge of Swiftcurrent Creek at Sherburne Lake, Mont., for the year ending Sept. 30, 1913.

[Drainage area, 64.0 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
October	144	69	93.4	1.46	1.68	5,740	B.
November	132	66	92.0	1.44	1.61	5,470	B.
December 1-15	71	47	62.0	.969	.54	1,840	C.
May	1,850	103	516	8.06	9.29	31,700	B.
June	1,500	853	1,070	16.7	18.63	63,700	B.
July	1,140	243	430	6.72	7.75	26,400	B.
August	366	151	274	4.28	4.93	16,800	B.
September	151	84	116	1.81	2.02	6,900	B.

OTTERTAIL RIVER NEAR FERGUS FALLS, MINN.

Location.—At Threemile Bridge, 3½ miles northeast of Fergus Falls, between secs. 18 and 19, T. 133 N., R. 42 W., several miles above the outlet of Wall Lake and 20 miles below Ottertail Lake, through which the river flows.

Records available.—May 9, 1904, to October 22, 1913. A gaging station was maintained from May 1, 1899, to May 14, 1904, by the Engineer Corps, United States Army, at the outlet of Ottertail Lake, where the drainage area is about 12 per cent less than at the Geological Survey station, with no important tributaries intervening. The observations at Fergus Falls in connection with those at the outlet of Ottertail Lake furnish a 14-year record of flow of the river below Ottertail Lake. A concrete dam has been built about 500 feet below the gage for the purpose of diverting water into a power canal. Backwater from this dam appeared at the gage about October 4, 1913. The station was therefore discontinued on October 22, 1913, and reestablished on October 29, 1913, about 5 miles above the old site.

Drainage area.—1,310 square miles.

Gage.—Chain attached to the bridge; read once daily to half-tenths. Limits of use: Half-tenths below and tenths above 4.0 feet.

Channel and control.—Practically permanent.

Discharge measurements.—Discharge measurements are made from the bridge except at extreme low stages, when they are made at a wading section.

Winter flow.—The river is frozen over from December to March and measurements are made to determine the winter flow.

Regulation.—Ottertail Lake, about 22 square miles in area, forms a natural reservoir which regulates the flow of the river to such an extent that the recorded range of stage has not exceeded 2 feet. On the upper part of the river are a number of dams used in driving logs to the sawmill at Frazee, where the lowest dam is built. The next dam below Frazee is at Maine, several miles below Ottertail Lake, about sec. 35, T. 134 N., R. 41 W. During the low-water season the closing of the turbine gates at Maine may have an effect on the flow immediately below the dam. Small lakes through which the river flows before reaching the gaging station tend to equalize the flow at the latter point. Below the station there are a number of power plants, but owing to the fall of the river their influence is not observable at the gage.

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Discharge measurements of Ottertail River near Fergus Falls, Minn., during the period Oct. 1, 1912, to Oct. 22, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
1912.				1913.			
Dec. 17	S. B. Soulé.....	3.23	a 152	Feb. 20	S. B. Soulé.....	3.86	a 73.9
				May 27	.....do.....	2.88	247
1913.				Oct. 22	W. G. Hoyt.....	3.45	343
Jan. 18	.....do.....	3.47	a 97.5				

a Complete ice cover.

Daily gage height, in feet, of Ottertail River near Fergus Falls, Minn., for period Oct. 1, 1912, to Oct. 22, 1913.

[H. G. Evensen, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	2.7	2.7	2.8	.....	.....	.....	3.8	2.8	2.85	2.8	2.7	2.9	2.85
2	2.7	2.7	2.8	.....	.....	.....	3.75	2.8	2.85	2.8	2.7	2.9	2.9
3	2.7	2.7	2.9	3.4	.....	.....	3.6	2.8	2.9	2.8	2.7	3.1	2.9
4	2.7	2.7	.....	.....	.....	.....	3.4	2.8	2.9	3.6	2.7	3.1	3.4
5	2.7	2.65	.....	.....	.....	.....	3.3	2.8	2.9	3.8	2.7	3.05	3.4
6	2.7	2.65	.....	.....	3.4	3.7	3.2	2.8	2.9	3.6	2.7	3.0	3.4
7	2.65	2.65	.....	.....	.....	.....	3.05	2.85	2.9	3.45	2.7	3.0	3.4
8	2.65	2.7	.....	.....	.....	.....	2.95	2.85	2.9	3.3	2.7	3.4	3.4
9	2.7	2.6	.....	.....	.....	.....	2.9	2.85	2.85	3.3	2.7	3.4	3.35
10	2.6	2.7	2.85	3.4	.....	.....	2.85	2.85	2.85	3.2	2.7	3.4	3.35
11	2.7	2.7	.....	.....	.....	.....	2.7	2.85	2.85	3.2	2.65	3.35	3.35
12	2.7	2.7	.....	.....	.....	.....	2.6	2.85	2.8	3.1	2.65	3.3	3.35
13	2.7	2.7	.....	.....	.....	4.3	2.6	2.85	2.8	3.0	2.65	3.3	3.35
14	2.7	2.7	.....	.....	3.6	.....	2.6	2.9	2.8	2.95	3.0	3.3	3.4
15	2.7	2.7	.....	.....	.....	.....	2.55	2.9	2.8	2.9	3.0	3.25	3.4
16	2.65	2.7	.....	3.55	.....	.....	2.55	2.95	2.8	2.9	2.9	3.25	3.4
17	2.65	2.7	3.25	.....	.....	.....	2.6	2.95	2.8	2.85	2.9	3.2	3.4
18	2.65	2.7	.....	3.5	.....	.....	2.65	2.95	2.75	2.8	2.9	3.15	3.4
19	2.65	2.7	3.3	.....	.....	.....	2.7	2.95	2.75	2.8	3.1	3.1	.....
20	2.65	2.6	.....	.....	3.85	.....	2.7	2.9	2.75	2.8	3.1	3.0	.....
21	2.65	2.75	.....	.....	.....	4.2	2.7	2.9	2.75	2.8	3.05	3.0	.....
22	2.65	2.75	.....	.....	.....	.....	2.7	2.9	2.75	2.8	3.05	3.0	3.45
23	2.65	2.75	.....	3.6	.....	.....	2.75	2.95	2.75	2.8	3.05	3.0	.....
24	2.7	2.75	.....	.....	.....	.....	2.75	2.95	2.75	2.85	3.0	3.0	.....
25	2.7	2.75	.....	.....	.....	.....	2.75	2.95	2.8	2.85	3.0	2.95	.....
26	2.7	2.7	3.4	.....	.....	.....	2.75	2.95	2.8	2.85	3.0	2.95	.....
27	2.7	2.7	.....	.....	3.65	.....	2.75	2.9	2.8	2.85	2.95	2.9	.....
28	2.7	2.8	.....	.....	.....	4.1	2.75	2.9	2.8	2.8	2.95	2.9	.....
29	2.7	2.7	.....	.....	.....	.....	2.8	2.9	2.8	2.8	2.9	2.9	.....
30	2.6	2.8	.....	3.65	.....	3.9	2.8	2.85	2.8	2.75	2.9	2.85	.....
31	2.7	.....	.....	.....	.....	3.85	.....	2.85	.....	2.75	2.9	.....	.....

NOTE.—Discharge relation affected by ice about Nov. 30, 1912, to Apr. 11, 1913, and by backwater from the dam about Oct. 4-22, 1913. See "Gage" in station description.

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Daily discharge, in second-feet, of Ottertail River near Fergus Falls, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	201	201	.....	.....	.....	.....	.....	236	255	236	201	274
2	201	201	.....	.....	.....	.....	.....	236	255	236	201	274
3	201	201	.....	.....	.....	.....	.....	236	274	236	201	357
4	201	201	.....	.....	.....	.....	.....	236	274	607	201	357
5	201	184	.....	.....	.....	.....	.....	236	274	726	201	336
6	201	184	.....	.....	.....	.....	.....	236	274	607	201	315
7	184	184	.....	.....	.....	.....	.....	255	274	526	201	315
8	184	201	.....	.....	.....	.....	.....	255	274	449	201	499
9	201	168	.....	.....	.....	.....	.....	255	255	449	201	499
10	168	201	.....	.....	.....	.....	.....	255	255	402	201	499
11	201	201	.....	.....	.....	.....	.....	255	255	402	184	474
12	201	201	.....	.....	.....	.....	168	255	236	357	184	449
13	201	201	.....	.....	.....	.....	168	255	236	315	184	449
14	201	201	.....	.....	.....	.....	168	274	236	294	315	449
15	201	201	.....	.....	.....	.....	153	274	236	274	315	426
16	184	201	.....	.....	.....	.....	153	294	236	274	274	426
17	184	201	.....	.....	.....	.....	168	294	236	255	274	402
18	184	201	.....	.....	.....	.....	184	294	218	236	274	380
19	184	201	.....	.....	.....	.....	201	294	218	236	357	357
20	184	168	.....	.....	.....	.....	201	274	218	236	357	315
21	184	218	.....	.....	.....	.....	201	274	218	236	336	315
22	184	218	.....	.....	.....	.....	201	274	218	236	336	315
23	184	218	.....	.....	.....	.....	218	294	218	236	336	315
24	201	218	.....	.....	.....	.....	218	294	218	255	315	315
25	201	218	.....	.....	.....	.....	218	294	236	255	315	294
26	201	201	.....	.....	.....	.....	218	294	236	255	315	294
27	201	201	.....	.....	.....	.....	218	274	236	255	294	274
28	201	236	.....	.....	.....	.....	218	274	236	236	294	274
29	201	201	.....	.....	.....	.....	236	274	236	236	274	274
30	168	a 200	.....	.....	.....	.....	236	255	236	218	274	255
31	201	.....	.....	.....	.....	.....	.....	255	.....	218	274	.....

a Estimated.

NOTE.—Daily discharge computed from a well-defined rating curve. Discharge estimated, because of ice, from gage heights, observer's notes, discharge measurements, climatic records, as follows: Dec. 1-31, 164 second-feet; Jan. 1-17, 112 second-feet; Jan. 18-31, 92 second-feet; Feb. 1-19, 80 second-feet; Feb. 20-28, 70 second-feet; Mar. 1-31, 130 second-feet; and Apr. 1-11, 150 second-feet.

Discharge for the period Oct. 1-22, 1913, estimated as follows: Oct. 1, 255 second-feet; Oct. 2 and 3, 274 second-feet; and Oct. 4-22, 318 second-feet. See "Gage" in station description.

Monthly discharge of Ottertail River neat Fergus Falls, Minn., from Oct. 1, 1912, to Oct. 22, 1913.

[Drainage area, 1,310 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
October, 1912	201	168	193	0.147	0.17	11,900	A.
November	236	168	201	.153	.17	12,000	A.
December	.....	.....	164	.125	.14	10,100	B.
January	.....	.....	103	.079	.09	6,330	C.
February	.....	.....	76.8	.059	.06	4,270	C.
March	.....	.....	130	.099	.11	7,990	C.
April	236	.....	180	.137	.15	10,700	C.
May	294	236	266	.203	.23	16,400	B.
June	274	218	243	.185	.21	14,500	B.
July	726	218	322	.246	.28	19,800	B.
August	357	184	261	.199	.23	16,000	B.
September	499	255	359	.274	.31	21,400	B.
The year	726	.....	209	.160	2.15	151,000	
Oct. 1-22, 1913	.....	.....	311	.237	.19	13,600	B.

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RED RIVER AT FARGO, N. DAK.

Location.—At the highway bridge connecting Front Street, Fargo, N. Dak., with Moorhead, Minn., 10 miles above the mouth of Sheyenne River.

Records available.—May 27, 1901, to September 30, 1913.

Drainage area.—6,020 square miles.

Gage.—Vertical staff attached to the breakwater for the center pier of the Front Street Bridge; read from the bridge or the river banks by the aid of a field glass.

Channel and control.—Clay and silt; slightly shifting.

Discharge measurements.—Made from the Front Street Bridge and the Northern Pacific Railway bridge.

Winter flow.—Discharge relation affected by ice from about the middle of November to the first of April; observations discontinued. At the spring break-up on account of the comparatively sluggish current and the fact that the river flows northward into a colder district, a pronounced backwater effect is usually caused by ice jams and partial ice jams.

Regulation.—There is a low dam of steel sheet piling a few rods below the footbridge at Fargo Waterworks, one-half mile above the gage. This dam, a tight overflow weir without sluices, was built in August, 1910, for the purpose of maintaining a sufficient depth of water for the intake pipe of the waterworks, and raises the water about 5 feet at lowest stage. Conditions of flow at the gage are not affected by this dam.

Accuracy.—Because of the inaccessibility of the gage, the relatively poor conditions for making accurate discharge measurements, and the slightly shifting channel, records can not be rated better than fair.

Discharge measurements of Red River at Fargo, N. Dak., during the year ending Sept. 30, 1913.

Date.	Made by.	Gage height.	Discharge.	Date.	Made by.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 30	W. B. Stevenson.....	7.53	228	Aug. 23	W. B. Stevenson.....	8.88	524
June 2	.....do.....	8.31	336	Sept. 11	.....do.....	8.91	568
Aug. 9	.....do.....	7.28	172				

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Daily gage height, in feet, of Red River at Fargo, N. Dak., for the year ending Sept. 30, 1913.

[E. H. Grasse, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	8.0	7.7	7.1	.....	.....	.....	8.6	7.9	8.2	8.1	7.9	7.6
2	7.9	7.6	7.1	.....	.....	.....	8.8	7.9	8.2	8.5	7.8	7.4
3	7.9	7.7	7.2	.....	.....	.....	8.8	7.9	8.3	8.8	7.7	7.4
4	7.8	7.7	7.2	.....	.....	.....	8.9	8.0	8.3	9.0	7.4	7.5
5	7.7	7.8	7.1	.....	.....	.....	9.0	8.1	8.3	9.4	7.3	7.7
6	7.6	7.7	7.1	.....	.....	.....	9.1	8.1	8.2	10.8	7.2	8.0
7	7.6	7.5	7.1	.....	.....	.....	9.2	8.0	8.2	11.4	7.2	8.2
8	7.7	7.4	.....	.....	.....	.....	9.2	7.9	8.2	11.9	7.2	8.4
9	7.7	7.5	.....	.....	.....	.....	9.0	8.0	8.2	11.8	7.1	8.5
10	7.7	7.5	.....	.....	.....	.....	8.8	8.0	8.2	11.7	7.2	8.9
11	7.6	7.6	.....	.....	.....	.....	8.7	8.0	8.3	11.1	7.2	9.0
12	7.6	7.6	.....	.....	.....	.....	8.5	8.0	8.3	10.6	7.3	9.1
13	7.6	7.5	.....	.....	.....	.....	8.6	8.0	8.2	9.9	7.3	9.3
14	7.6	7.4	.....	.....	.....	.....	8.8	8.1	8.2	9.7	7.4	9.5
15	7.7	7.3	.....	.....	.....	.....	10.0	8.1	8.1	9.5	7.4	9.7
16	7.7	7.2	.....	.....	.....	.....	9.6	8.2	8.0	9.2	7.3	9.9
17	7.7	7.1	.....	.....	.....	.....	9.3	8.3	7.9	9.1	7.4	9.7
18	7.6	7.1	.....	.....	.....	.....	8.5	8.3	7.9	8.5	7.5	9.1
19	7.5	7.2	.....	.....	.....	.....	8.2	8.3	8.0	8.2	7.6	8.6
20	7.5	7.3	.....	.....	.....	.....	8.2	8.3	8.0	8.2	7.9	8.4
21	7.6	7.4	.....	.....	.....	.....	8.1	8.4	8.0	8.2	8.1	8.3
22	7.6	7.4	.....	.....	.....	.....	8.0	8.4	8.0	8.1	8.6	8.2
23	7.6	7.4	.....	.....	.....	.....	8.0	8.5	8.0	8.1	8.9	8.0
24	7.6	7.3	.....	.....	.....	.....	8.0	8.6	8.1	8.1	8.8	7.9
25	7.5	7.2	.....	.....	.....	.....	7.9	8.6	8.1	8.1	8.7	7.9
26	7.5	7.0	.....	.....	.....	.....	7.9	8.5	8.1	8.1	8.6	7.9
27	7.5	6.9	.....	.....	.....	7.3	7.9	8.5	8.1	8.0	8.4	7.9
28	7.5	7.0	.....	.....	.....	7.4	8.0	8.4	8.0	8.0	8.2	8.0
29	7.5	7.0	.....	.....	.....	7.9	8.0	8.4	8.0	8.0	8.0	8.0
30	7.6	7.1	.....	.....	.....	8.1	7.9	8.4	7.9	7.9	7.9	8.0
31	7.6	.....	.....	.....	.....	8.4	.....	8.3	.....	8.0	7.8	.....

NOTE.—Discharge relation affected by ice about Nov. 19, 1912, to Mar. 31, 1913.

Daily discharge, in second-feet, of Red River at Fargo, N. Dak., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	326	261	93	.....	.....	.....	455	290	358	335	290	227
2	304	240	78	.....	.....	.....	508	290	358	430	268	190
3	304	261	93	.....	.....	.....	508	290	382	508	247	190
4	282	261	78	.....	.....	.....	536	312	382	565	190	208
5	261	282	64	.....	.....	.....	565	335	382	685	173	247
6	240	261	64	.....	.....	.....	595	335	358	1,120	157	312
7	240	220	64	.....	.....	.....	625	312	358	1,300	157	358
8	261	200	.....	.....	.....	.....	625	290	358	1,460	157	406
9	261	220	.....	.....	.....	.....	565	312	358	1,430	142	430
10	261	220	.....	.....	.....	.....	508	312	358	1,400	157	536
11	240	240	.....	.....	.....	.....	481	312	382	1,210	157	565
12	240	240	.....	.....	.....	.....	430	312	382	1,060	173	595
13	240	220	.....	.....	.....	.....	455	312	358	839	173	655
14	240	200	.....	.....	.....	.....	508	335	358	777	190	715
15	261	181	.....	.....	.....	.....	870	335	335	715	190	777
16	261	162	.....	.....	.....	.....	746	358	312	625	173	839
17	261	144	.....	.....	.....	.....	655	382	290	595	190	777
18	240	144	.....	.....	.....	.....	430	382	290	430	208	595
19	220	144	.....	.....	.....	.....	358	382	312	358	227	455
20	220	162	.....	.....	.....	.....	358	382	312	358	290	406
21	240	162	.....	.....	.....	.....	335	406	312	358	335	382
22	240	162	.....	.....	.....	.....	312	406	312	335	455	358
23	240	162	.....	.....	.....	.....	312	430	312	335	536	312
24	240	144	.....	.....	.....	.....	312	455	335	335	508	290
25	220	126	.....	.....	.....	.....	290	455	335	335	481	290
26	220	94	.....	.....	.....	.....	290	430	335	335	455	290
27	220	78	.....	.....	.....	.....	290	430	335	312	406	290
28	220	93	.....	.....	.....	.....	312	406	312	312	358	312
29	220	93	.....	.....	.....	.....	312	406	312	312	312	312
30	240	93	.....	.....	.....	.....	290	406	290	290	290	312
31	240	.....	.....	.....	.....	.....	.....	382	.....	312	268	.....

NOTE.—Daily discharge computed from two fairly well defined rating curves. Discharge estimated because of ice from Nov. 19 to Dec. 7, 1912.

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Monthly discharge of Red River at Fargo, N. Dak., for the year ending Sept. 30, 1913.

Month.	Discharge in second-feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
October	326	220	248	B.
November	282	78	182	C.
December	93	64	76.3	D.
April	870	290	461	C.
May	455	290	361	C.
June	382	290	339	C.
July	1,460	290	638	B.
August	536	142	270	A.
September	839	190	421	B.

RED RIVER AT GRAND FORKS, N. DAK.

Location.—At the Northern Pacific Railway bridge between Grand Forks, N. Dak., and East Grand Forks, Minn., about half a mile below mouth of Red Lake River.

Records available.—May 26, 1901, to September 30, 1913. Gage-height records have, however, been kept by the United States Engineer Corps for about 30 years at this point.

Drainage area.—25,000 square miles.

Gages.—Staff and chain, attached to Northern Pacific Railway bridge. As a rule the chain gage is read only during periods of extremely low water. The United States Engineer Corps gage is on the breakwater to which the United States Geological Survey staff gage is attached, but at a datum 5 feet higher.

Channel and control.—Clay and silt; shifts slightly.

Discharge measurements.—Made from the Great Northern Railway bridge about one-fifth mile above gage.

Winter flow.—The river flows under smooth ice from about the middle of November to the middle of April; the flow during the winter fluctuates little, and since 1895 enough discharge measurements have been made each winter to give fairly satisfactory summaries for the winter.

When the ice breaks up in the spring, because the river has only a gentle current and because it flows north into cooler regions where the river is not yet open, the gage reading is usually excessively and disproprotionately high for a few days or weeks, so that the figures for quantity of flow must depend largely on estimation; actual measurements when the river appeared entirely open and clear of ice at this point have sometimes shown the gage reading to be 5 feet greater than would have been needed for the same discharge later in the season, after the whole length of the river was entirely open.

Regulation.—There are no dams or other obstructions below, nor rapids, the channel being fairly uniform for miles. Above there are no power plants, dams, or reservoirs affecting the flow nearer than Crookston, on Red Lake River, 25 miles above Grand Forks, along the general course of the valley; about half the water comes from Red Lake River, but the storage at the Crookston plant is so small that no fluctuations caused by it have been discovered at Grand Forks. On the other branch, the Red River proper, and its tributaries above Grand Forks, there are no reservoirs or power plants for a hundred miles above.

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Discharge measurements of Red River at Grand Forks, N. Dak., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 12	Chandler and Stevenson	6.30	1,210	Apr. 17	E. J. Budge	15.86	7,310
Nov. 8	W. B. Stevenson	5.12	923	28	do	10.47	3,620
12	do	5.02	942	May 12	do	7.24	1,730
Dec. 12	do	5.00	a 473	23	do	6.84	1,620
Jan. 25	E. J. Budge	4.50	a 319	July 3	Chandler and Stevenson.	5.18	973
Mar. 8	W. B. Stevenson	3.90	a 196				
21	E. J. Budge	4.80	a 326	Sept. 8	do	4.09	568

a River frozen over.

Daily gage height, in feet, of Red River at Grand Forks, N. Dak., for the year ending Sept. 30, 1913.

[H. L. Hayes, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	9.0	5.7					7.9	8.8	6.4	5.2	5.0	4.9
2	8.8	5.6					10.0	8.7	6.3	5.3	5.1	4.8
3	8.6	5.2				3.0	14.5	8.0	6.4	5.1	4.8	4.6
4	8.3	5.2		4.4			18.6	8.4	6.5	5.0	4.8	4.4
5	7.8	5.2					22.4	7.7	6.6	4.9	4.7	4.3
6	7.4	5.1					25.3	8.0	6.6	4.8	4.6	4.2
7	7.0	5.0	5.2		3.2		26.4	7.6	6.8	4.7	4.4	4.1
8	6.8	5.1					26.6	7.9	6.5	4.8	4.4	4.0
9	6.7	5.2					26.4	7.8	6.4	5.1	4.4	4.0
10	6.6	5.2					25.4	7.6	6.4	6.2	4.2	4.3
11	6.4	5.2		4.3			24.0	7.4	6.2	6.8	4.1	5.3
12	6.3	5.0	5.0				22.6	7.3	6.2	7.1	4.0	6.0
13	6.0	5.0					20.4	7.2	6.1	7.0	4.0	6.6
14	5.9	4.9	4.8				18.2	7.2	6.0	6.8	4.0	6.5
15	5.8	4.8			3.0		16.8	7.2	5.8	6.5	4.0	6.4
16	5.6	4.5					16.2	7.2	5.6	6.2	4.0	6.3
17	5.5	4.6					15.9	7.0	5.4	6.0	4.0	6.6
18	5.6	4.0		4.1			15.5	7.2	5.3	5.8	4.0	6.9
19	5.5	4.4					14.9	7.0	5.4	5.6	4.3	7.0
20	5.5	4.6			3.1		14.0	7.1	5.4	5.4	4.4	6.8
21	5.4	4.5	4.7				13.1	7.1	5.4	5.3	4.4	6.5
22	5.3	5.2				3.5	12.6	7.0	5.3	5.2	4.3	6.1
23	5.4	4.8					12.0	6.8	5.4	4.9	4.3	5.7
24	5.6	5.0					11.4	6.6	5.3	4.6	4.6	5.4
25	5.7	4.5		3.9			10.0	6.8	5.4	4.6	5.0	5.2
26	5.7	4.5					9.8	6.6	5.2	4.6	5.4	5.0
27	5.7	5.0					10.2	6.7	5.1	4.6	5.6	4.8
28	5.7	4.7	4.6				10.6	6.7	5.0	4.4	5.6	4.6
29	5.7	4.8				5.4	9.8	6.4	5.0	4.4	5.6	4.4
30	5.7	4.4		3.5		5.1	9.6	6.6	5.0	4.5	5.5	4.3
31	5.6					5.8		6.3		4.8	5.2	

NOTE.—Discharge relation affected by ice about Nov. 19, 1912, to Apr. 12, 1913.

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Daily discharge, in second-feet, of Red River at Grand Forks, N. Dak., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,520	1,150	.....	.....	.....	.....	.....	2,590	1,420	962	890	855
2	2,410	1,110	.....	.....	.....	.....	.....	2,530	1,380	998	926	820
3	2,310	962	.....	.....	.....	.....	.....	2,150	1,420	926	820	752
4	2,150	962	.....	.....	.....	.....	.....	2,370	1,460	890	820	686
5	1,900	962	.....	.....	.....	.....	.....	2,000	1,500	855	786	654
6	1,700	926	.....	.....	.....	.....	.....	2,150	1,500	820	752	622
7	1,520	890	.....	.....	.....	.....	.....	1,950	1,590	786	686	591
8	1,430	926	.....	.....	.....	.....	.....	2,100	1,460	820	686	560
9	1,390	962	.....	.....	.....	.....	.....	2,050	1,420	926	686	560
10	1,340	962	.....	.....	.....	.....	.....	1,950	1,420	1,340	622	654
11	1,260	962	.....	.....	.....	.....	.....	1,850	1,340	1,590	591	998
12	1,210	890	.....	.....	.....	.....	.....	1,810	1,340	1,720	560	1,260
13	1,090	890	.....	.....	.....	.....	11,200	1,760	1,300	1,670	560	1,500
14	1,050	855	.....	.....	.....	.....	9,250	1,760	1,260	1,590	560	1,460
15	1,010	820	.....	.....	.....	.....	8,080	1,760	1,180	1,460	560	1,420
16	940	719	.....	.....	.....	.....	7,610	1,760	1,110	1,340	560	1,380
17	905	752	.....	.....	.....	.....	7,370	1,670	1,030	1,260	560	1,500
18	940	560	.....	.....	.....	.....	7,070	1,760	998	1,180	560	1,630
19	905	.....	.....	.....	.....	.....	6,630	1,670	1,030	1,110	654	1,670
20	905	.....	.....	.....	.....	.....	5,980	1,720	1,030	1,030	686	1,590
21	885	.....	.....	.....	.....	.....	5,350	1,720	1,030	998	686	1,460
22	864	.....	.....	.....	.....	.....	5,010	1,670	998	962	654	1,300
23	912	.....	.....	.....	.....	.....	4,600	1,590	1,030	855	654	1,150
24	998	.....	.....	.....	.....	.....	4,200	1,500	998	752	752	1,030
25	1,050	.....	.....	.....	.....	.....	3,300	1,590	1,030	752	890	962
26	1,070	.....	.....	.....	.....	.....	3,180	1,500	962	752	1,030	890
27	1,080	.....	.....	.....	.....	.....	3,430	1,540	926	752	1,110	820
28	1,100	.....	.....	.....	.....	.....	3,680	1,540	890	686	1,110	752
29	1,110	.....	.....	.....	.....	.....	3,180	1,420	890	686	1,110	686
30	1,130	.....	.....	.....	.....	.....	3,050	1,500	890	719	1,070	654
31	1,110	.....	.....	.....	.....	.....	.....	1,380	.....	820	962	.....

NOTE.—Discharge determined from two curves, the first applicable from Oct. 1–20, 1912, and well defined above 1,000 second-feet and fairly well defined between 600 and 1,000 second-feet; the second applicable from Nov. 1 to 18, 1912, and Apr. 13 to Sept. 30, 1913, and well defined above 800 second-feet. Shifting-channel method used from Oct. 21 to 31, 1912. Mean discharge for periods affected by ice estimated from discharge measurements, observer's notes, and weather reports, as follows: Nov. 19–30, 650 second-feet; Dec. 1–31, 1912, 422 second-feet; Jan. 1–31, 1913, 318 second-feet; Feb. 1–28, 233 second-feet; Mar. 1–31, 282 second-feet; and Apr. 1–12, 9,140 second-feet. Discharge Nov. 1–18, 1912, differs from that published in Water Supply Paper 325 on account of a revision of the rating curve.

Monthly discharge of Red River at Grand Forks, N. Dak., for the year ending Sept. 30, 1913.

Month.	Discharge in second-feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
October	2,520	864	1,300	B.
November	1,150	.....	802	B.
December	.....	.....	422	C.
January	.....	.....	318	C.
February	.....	.....	233	C.
March	.....	.....	282	C.
April	.....	.....	7,060	C.
May	2,590	1,380	1,820	A.
June	1,590	890	1,190	A.
July	1,720	686	1,030	A.
August	1,110	560	760	B.
September	1,670	560	1,030	A.
The year	.....	.....	1,350	

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WILD RICE RIVER AT TWIN VALLEY, MINN.

Location.—At the highway bridge at Twin Valley, 2 miles above the nearest tributary, which enters at Heiberg.

Records available.—June 30, 1909, to September 30, 1913.

Drainage area.—805 square miles.

Gage.—Vertical staff; read morning and evening, to half-tenths. Limits of use: Hundredths below 5.0, half-tenths from 5.0 to 6.5 and tenths above 6.5 feet.

Channel and control.—Practically permanent. The river overflows at a stage of 12 feet on the gage and covers an area several hundred feet wide.

Discharge measurements.—Made from the bridge except at extreme low stages, when they are made at a wading station.

Floods.—An exceptionally severe flood occurred in July, 1909, which overflowed the lower part of the valley and wrecked the power dam at Faith by cutting around the end and greatly increasing the width of the channel. The maximum stage of the flood at Twin Valley was 20 feet and the discharge about 9,200 second-feet.

Regulation.—There is a dam across the river at Heiberg, but the highest point affected by the backwater is more than a mile below Twin Valley. Discharge at the station is affected by the storage created by the dams at the lower end of Lower Rice Lake and at the outlet of Twin Lakes.

Discharge measurements of Wild Rice River at Twin Valley, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 24	W. B. Stevenson.....	[a] 5.23	16.3	Sept. 6	W. B. Stevenson.....	[b] 5.11	56.6
Feb. 9	E. J. Budge.....	[a] 5.80	10.4	7	.....do.....	[b] 5.48	101
Apr. 12	.....do.....	6.30	332				

[a] Complete ice cover.
[b] Measurement made by wading at a section 200 feet below gage. Discharge relation affected by back water from a log jam 100 feet below gage.

Daily gage height, in feet, of Wild Rice River at Twin Valley, Minn., for the year ending Sept. 30, 1913.

[Axel Johnson, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	5.4	5.3	.....	.....	.....	.....	8.8	5.3	6.6	5.0	6.5	4.50
2	5.3	5.25	.....	.....	.....	.....	9.5	5.2	6.45	4.90	6.5	4.80
3	5.25	5.25	.....	.....	.....	5.6	9.4	5.2	6.6	4.90	6.4	4.90
4	5.15	5.2	.....	.....	5.45	.....	9.0	5.2	6.6	4.90	6.3	5.05
5	5.1	5.2	.....	.....	.....	.....	8.1	5.35	6.8	4.82	6.15	5.25
6	5.1	5.2	.....	5.45	.....	.....	7.6	5.3	6.7	4.80	6.0	5.1
7	5.1	5.2	.....	.....	.....	.....	7.3	5.3	6.6	4.80	6.0	5.4
8	5.0	5.2	.....	.....	.....	.....	6.8	5.15	6.6	4.80	5.9	5.0
9	4.90	5.2	5.0	.....	.....	.....	6.6	5.1	6.5	4.80	5.8	5.3
10	4.90	5.0	.....	.....	5.65	7.0	6.5	5.2	6.5	4.80	5.8	5.5
11	4.90	4.90	.....	.....	.....	.....	6.4	5.2	6.45	4.80	5.8	5.4
12	4.90	4.85	.....	.....	.....	.....	6.35	5.15	6.5	4.72	5.7	5.45
13	4.90	4.80	.....	.....	.....	.....	6.2	5.1	6.1	4.80	5.6	5.4
14	4.90	4.70	.....	5.65	.....	.....	6.2	5.1	5.75	4.88	5.6	5.2
15	4.80	4.70	.....	.....	.....	.....	5.95	5.1	6.1	4.92	5.6	5.1
16	4.80	4.70	5.1	.....	.....	.....	5.8	5.3	6.15	4.90	5.4	5.1
17	5.0	4.80	.....	.....	5.55	5.95	5.7	5.4	6.2	4.90	5.8	5.2
18	6.05	4.80	.....	.....	.....	4.60	5.8	5.25	6.25	4.90	5.4	5.2
19	5.9	4.70	.....	.....	.....	.....	5.5	5.1	6.25	4.78	5.4	5.1
20	5.9	4.60	.....	5.75	.....	.....	5.5	5.1	6.3	4.68	5.4	5.0
21	5.9	4.70	.....	.....	.....	.....	5.5	5.15	6.3	4.70	5.3	4.90
22	5.9	4.70	.....	.....	.....	.....	5.4	5.1	6.05	4.70	5.2	4.80
23	5.9	4.60	5.2	.....	.....	.....	5.9	5.1	6.0	4.70	5.1	4.80
24	5.9	4.65	5.2	.....	5.55	5.65	6.1	5.1	6.05	4.70	5.0	4.80
25	5.8	4.70	.....	.....	.....	.....	5.85	5.05	5.9	4.85	4.90	4.80
26	5.7	4.90	.....	.....	.....	.....	5.65	4.92	5.9	5.7	4.80	4.90
27	5.6	4.90	.....	5.35	.....	.....	5.5	5.45	5.85	6.3	4.90	4.90
28	5.6	5.1	.....	.....	.....	.....	5.45	5.7	5.5	6.6	4.95	4.90
29	5.55	5.15	.....	.....	.....	.....	5.3	5.7	5.25	6.4	4.80	4.90
30	5.5	4.70	5.2	.....	.....	.....	5.4	5.6	5.1	6.4	4.70	4.90
31	5.4	.....	.....	.....	.....	8.0	.....	6.15	.....	6.4	4.50	.....

NOTE.—Discharge relation affected by ice about Nov. 17, 1912, to Mar. 30, 1913, and by backwater from logs about July 28 to Sept. 30.

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Daily discharge, in second-feet, of Wild Rice River at Twin Valley, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	168	148	.....	.....	.....	.....	1,250	123	405	75	233	12
2	148	138	.....	.....	.....	.....	1,560	106	365	61	233	30
3	138	138	.....	.....	.....	.....	1,520	106	405	61	218	37
4	120	129	.....	.....	.....	.....	1,340	106	405	61	203	50
5	110	129	.....	.....	.....	.....	955	132	464	51	182	70
6	110	129	.....	.....	.....	.....	756	123	434	48	161	54
7	110	129	.....	.....	.....	.....	639	123	405	48	161	86
8	92	129	.....	.....	.....	.....	464	98	405	48	148	45
9	75	129	.....	.....	.....	.....	405	90	378	48	135	75
10	75	92	.....	.....	.....	.....	378	106	378	48	135	98
11	75	75	.....	.....	.....	.....	352	106	365	48	135	86
12	75	67	.....	.....	.....	.....	340	98	378	38	122	92
13	75	59	.....	.....	.....	.....	303	90	280	48	110	86
14	75	44	.....	.....	.....	.....	303	90	205	58	110	64
15	59	44	.....	.....	.....	.....	247	90	280	64	110	54
16	59	44	.....	.....	.....	.....	215	123	292	61	86	54
17	92	.....	.....	.....	.....	.....	195	140	303	61	135	64
18	307	.....	.....	.....	.....	.....	215	114	315	61	86	64
19	272	.....	.....	.....	.....	.....	158	90	315	46	86	54
20	272	.....	.....	.....	.....	.....	158	90	327	34	86	45
21	272	.....	.....	.....	.....	.....	158	98	327	36	75	37
22	272	.....	.....	.....	.....	.....	140	90	269	36	64	30
23	272	.....	.....	.....	.....	.....	236	90	258	36	54	30
24	272	.....	.....	.....	.....	.....	280	90	269	36	45	30
25	250	.....	.....	.....	.....	.....	226	82	236	54	37	30
26	228	.....	.....	.....	.....	.....	186	64	236	195	30	37
27	208	.....	.....	.....	.....	.....	158	149	226	203	37	37
28	208	.....	.....	.....	.....	.....	149	195	158	248	41	37
29	198	.....	.....	.....	.....	.....	123	195	114	218	30	37
30	188	.....	.....	.....	.....	.....	140	176	90	218	23	37
31	168	.....	.....	.....	.....	.....	.....	292	.....	218	12	.....

NOTE.—Daily discharge Oct. 1 to Nov. 16, 1912, and Apr. 1 to July 26, 1913, computed from two fairly well defined rating curves. About July 28, 1913, log driving was attempted and on account of the low stage logs lodged along the shores of the channel causing backwater at the gage. The logs remained in the channel throughout the remainder of the year. Daily discharge July 27 to Sept. 30, 1913, computed from a fairly well defined rating curve based on five discharge measurements made during 1913 and 1914. Discharge estimated, because of ice, from gage heights, observer's notes, two discharge measurements, and climatic records, as follows: Nov. 17–30, 30 second-feet; Dec. 1–31, 19 second-feet; Jan. 1–15, 15 second-feet; Jan. 16–31, 10 second-feet; Feb. 1–15, 8 second-feet; Feb. 16–28, 10 second-feet; Mar. 1–15, 26 second-feet; and Mar. 16–31, 54 second-feet. A study of the rainfall records and a comparison of the flow of Wild Rice River at Twin Valley with the flow of Clearwater River at Red Lake Falls, indicate that the discharge relation was probably affected by backwater during June, 1913. Estimates of flow for this month should therefore be used with caution.

Monthly discharge of Wild Rice River at Twin Valley, Minn., for the year ending Sept. 30, 1913.

Month.	Discharge in second-feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
October	307	59	163	B.
November	148	.....	68.1	C.
December	.....	.....	19	D.
January	.....	.....	12	D.
February	.....	.....	9	D.
March	.....	.....	40	D.
April	1,560	123	452	B.
May	292	64	118	B.
June	464	90	310	D.
July	248	34	82.8	B.
August	233	12	107	B.
September	98	12	52.1	B.
The year	1,560	.....	119	

NOTE.—See footnote to table of daily discharge.

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RED LAKE RIVER AT THIEF RIVER FALLS, MINN.

Location.—One-third mile below the dam at Thief River Falls, and a mile or more below the mouth of Thief River.

Records available.—July 2, 1909, to September 30, 1913.

Drainage area.—3,430 square miles.

Gage.—Vertical and inclined staff; read daily, morning and evening, to half-tenths. Limits of use: Hundredths below 4.0, half-tenths from 4.0 to 5.0, and tenths above 5.0 feet. On September 5, 1913, the gage was checked with level and the inclined section (4.6–14.0 feet) found to be in error by amounts varying from 0.01 to 0.15 foot. As nothing is known as to the probable time when these errors entered into the gage readings, the daily gage heights and the gage heights of discharge measurements prior to September 5, 1913, are published as observed. On September 5, 1913, the inclined section was rebuilt. All gage heights subsequent to this date refer to the original gage datum.

Channel and control.—Channel practically permanent. The control is changed temporarily by log jams that form below.

Discharge measurements.—Made from a car and cable at the gage.

Winter flow.—The river is frozen over from the latter part of November to the first of April, and measurements are made through the ice to determine the winter flow.

Regulation.—A short distance above the station is the dam used by the Hansen & Barzen Milling Co. and the city lighting plant. The fluctuating loads on the turbines, produced by the operation of the lighting plant at night and of the mill chiefly during the day time, cause fluctuations in the river stage below the dam.

Accuracy.—Logs floated down the river may jam below the station and cause backwater. Conditions at this station are not satisfactory and similar conditions exist at all points on the upper river. Therefore, the records can not be considered better than fair.

Discharge measurements of Red Lake River at Thief River Falls, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 14	W. B. Stevenson	4.01	231	Aug. 14	E. F. Chandler	3.87	204
Dec. 22	do	3.43	[a] 25	15	do	3.88	223
Feb. 11	E. J. Budge	5.55	[b] 183	22	do	3.95	215
Apr. 9	do	7.72	[c] 1,960	Sept. 5	W. B. Stevenson	[d] 4.05	210
29	W. B. Stevenson	4.68	468				

[a] Partial ice cover.
[b] Complete ice cover.
[c] No ice passing; considerable ice above dam.
[d] New inclined gage.

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Daily gage height, in feet, of Red Lake River at Thief River Falls, Minn., for the year ending Sept. 30, 1913.

[C. P. Quist, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4.55	4.45	3.65	.....	.....	.....	5.3	4.7	4.2	3.7	3.75	3.75
2	4.6	4.05	4.4	.....	.....	.....	6.8	4.7	4.4	3.65	3.80	3.90
3	4.35	3.75	4.4	.....	.....	.....	7.8	4.8	4.3	3.95	3.45	3.80
4	4.4	4.5	4.25	4.6	4.1	4.2	8.7	4.6	4.3	3.70	3.75	3.55
5	4.35	4.55	4.3	.....	.....	.....	9.7	4.75	4.35	3.92	3.90	3.68
6	4.15	4.35	4.2	.....	.....	.....	10.8	4.75	4.4	3.45	3.85	3.85
7	4.45	4.2	4.25	4.8	4.5	4.4	9.4	4.65	4.15	4.15	3.85	3.50
8	4.4	4.35	3.55	.....	.....	.....	9.0	4.7	3.90	4.15	3.88	3.85
9	4.4	4.4	4.5	.....	.....	.....	7.8	4.75	4.3	4.05	3.75	3.80
10	4.35	3.95	4.48	4.6	.....	.....	7.0	4.7	4.25	3.95	3.25	3.95
11	4.35	4.5	4.55	.....	4.45	4.4	7.3	4.6	4.3	3.98	3.90	4.05
12	4.3	4.45	4.5	.....	.....	.....	7.1	4.75	4.35	4.0	3.92	3.90
13	4.0	4.45	4.5	.....	.....	.....	7.1	4.7	4.35	3.70	3.75	3.88
14	4.35	4.45	4.25	4.1	.....	4.2	7.2	4.7	4.3	3.90	3.90	3.50
15	4.25	4.4	.....	.....	4.5	.....	7.5	4.75	4.05	4.05	3.55	3.90
16	4.15	4.2	.....	.....	.....	.....	7.2	4.7	4.25	4.15	3.75	3.85
17	4.2	3.5	.....	.....	.....	.....	6.7	4.7	4.3	4.1	3.55	3.82
18	4.2	4.3	4.3	4.15	.....	4.7	6.4	4.55	4.25	4.1	3.98	3.82
19	4.15	4.4	.....	.....	4.5	.....	6.0	4.55	4.1	4.1	3.90	4.0
20	3.8	4.3	.....	.....	.....	.....	5.6	4.5	4.1	3.65	3.40	4.05
21	4.3	4.4	4.4	4.25	.....	.....	5.4	4.4	4.1	4.15	3.75	3.45
22	4.3	4.4	3.45	.....	4.4	4.1	5.2	4.4	3.85	3.95	3.60	4.0
23	4.2	4.4	.....	.....	.....	.....	5.1	4.5	4.25	4.0	3.70	4.0
24	4.2	3.2	4.3	4.1	.....	.....	5.0	4.5	4.25	4.0	3.45	3.85
25	4.2	4.15	.....	.....	4.5	4.1	4.7	4.15	4.2	4.1	4.1	3.75
26	4.4	4.3	.....	.....	.....	.....	4.9	4.4	4.15	4.05	3.95	3.98
27	4.0	4.3	4.3	.....	.....	.....	4.3	4.3	4.2	3.60	3.92	3.85
28	4.3	4.1	.....	4.15	4.5	4.0	4.4	4.4	4.15	4.15	3.95	3.65
29	4.3	4.25	.....	.....	.....	.....	4.8	4.3	3.85	4.1	3.85	3.85
30	4.45	4.25	.....	.....	.....	.....	4.7	4.3	4.0	3.98	3.85	3.92
31	4.4	.....	4.3	3.7	.....	.....	.....	4.4	.....	3.95	3.45	.....

NOTE.—Discharge relation probably affected by ice about Nov. 21, 1912, to Apr. 7, 1913.

Daily discharge, in second-feet, of Red Lake River at Thief River Falls, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	310	372	.....	.....	.....	.....	.....	456	293	153	166	166
2	325	248	.....	.....	.....	.....	.....	456	356	140	179	206
3	340	166	.....	.....	.....	.....	.....	491	324	220	90	179
4	356	389	.....	.....	.....	.....	.....	422	324	153	166	114
5	340	406	.....	.....	.....	.....	.....	474	340	212	206	115
6	278	340	.....	.....	.....	.....	.....	474	356	90	192	156
7	372	293	.....	.....	.....	.....	.....	439	278	278	192	78
8	356	340	.....	.....	.....	.....	3,550	456	206	278	201	156
9	356	356	.....	.....	.....	.....	2,340	474	324	248	166	143
10	340	220	.....	.....	.....	.....	1,660	456	308	220	51	183
11	340	389	.....	.....	.....	.....	1,900	422	324	228	206	212
12	324	372	.....	.....	.....	.....	1,740	474	340	234	212	169
13	234	372	.....	.....	.....	.....	1,740	456	340	153	166	164
14	340	372	.....	.....	.....	.....	1,820	456	324	206	206	78
15	308	356	.....	.....	.....	.....	2,070	474	248	248	114	169
16	278	293	.....	.....	.....	.....	1,820	456	308	278	166	156
17	293	102	.....	.....	.....	.....	1,440	456	324	263	114	148
18	293	324	.....	.....	.....	.....	1,250	406	308	263	228	148
19	278	356	.....	.....	.....	.....	1,020	406	263	263	206	197
20	179	324	.....	.....	.....	.....	815	399	263	140	79	212
21	324	.....	.....	.....	.....	.....	727	356	263	278	166	70
22	324	.....	.....	.....	.....	.....	644	356	192	220	127	197
23	293	.....	.....	.....	.....	.....	604	399	308	234	153	197
24	293	.....	.....	.....	.....	.....	565	399	308	234	90	156
25	293	.....	.....	.....	.....	.....	456	278	293	263	263	131
26	356	.....	.....	.....	.....	.....	527	356	278	248	220	191
27	234	.....	.....	.....	.....	.....	324	324	293	127	212	156
28	324	.....	.....	.....	.....	.....	356	356	278	278	220	108
29	324	.....	.....	.....	.....	.....	491	324	192	263	192	156
30	372	.....	.....	.....	.....	.....	456	324	234	228	192	175
31	356	.....	.....	.....	.....	.....	.....	356	.....	220	90	.....

NOTE.—Daily discharge computed from two fairly well defined rating curves. Rating curve used subsequent to Sept. 4, 1913, is referred to the new gage installed Sept. 5, 1913. See "Gage" in station description. Discharge estimated, because of ice, from gage heights, observer's notes, two discharge measurements, and climatic records, as follows: Nov. 21–30, 200 second-feet; Dec. 1, 1912, to Jan. 15, 1913, 125 second-feet; Jan. 16–31, 50 second-feet; Feb. 1–15, 70 second-feet; Feb. 16–28, 100 second-feet; Mar. 1–15, 80 second-feet; Mar. 16–31, 77 second-feet; and Apr. 1–7, 1,830 second-feet. See "Accuracy" in station description.

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Monthly discharge of Red Lake River at Thief River Falls, Minn., for the year ending Sept. 30, 1913.

Month.	Discharge in second-feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
October	372	179	314	B.
November	406	.....	280	C.
December	.....	.....	125	
January	.....	.....	86	D.
February	.....	.....	84	D.
March	.....	.....	78	D.
April	.....	.....	1,370	C.
May	491	278	413	B.
June	356	192	293	B.
July	278	90	221	B.
August	263	51	169	B.
September	212	70	156	B.
The year	.....	.....	298	

RED LAKE RIVER AT CROOKSTON, MINN.

Location.—At new Sampson's Addition highway bridge in Crookston, less than one-fourth mile below the dam and power house of the Crookston Waterworks, Power & Light Co.; no tributaries within several miles.

Records available.—May 19, 1901, to September 30, 1913.

Drainage area.—5,320 square miles.

Gage.—Automatic gage installed in September, 1911, replacing the chain gage which was attached to the new Sampson's Addition bridge July 1, 1909. The chain gage was set to read the same as the original gage which was fastened to the bridge 20 rods above. A vertical staff near the automatic reads to the same datum as the gages previously used.

Channel and control.—Changes slightly from year to year.

Discharge measurements.—Made from new bridge.

Winter flow.—During the winter of 1912 and 1913 the flow in the river was so smal that there was a greater effect on the discharge, expressed in per cent, due to the retardation of the velocity by ice, than would ordinarily occur. Estimates of discharge during the winter period are therefore not as accurate as might ordinarily be expected.

Accuracy.—The operation of the power plant causes fluctuations in the water surface at the station, but the use of the automatic gage should give good results.

Discharge measurements of Red Lake River at Crookston, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 1	W. B. Stevenson	6.18	1,650	May 3	Ole Christianson	5.02	1,020
Dec. 23	....do	4.57	[a] 438	5	....do	6.16	1,830
Jan. 18	E. J. Budge	3.20	[a] 80	5	....do	6.36	1,910
18	....do	3.43	[a] 93	20	....do	4.49	735
Feb. 8	....do	4.26	[a] 249	Aug. 12	E. F. Chandler	3.35	267
Apr. 12	Budge & Christianson	9.50	[b] 4,600	Sept. 6	W. B. Stevenson	3.23	183
14	....do	9.00	4,070				

[a] Measurement made under complete ice cover. [b] No ice running.

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Daily gage height, in feet, of Red Lake River at Crookston, Minn., for the year ending Sept. 30, 1913.

[J. H. Wallace, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July	Aug.	Sept.
1	6.2	3.8	.....	3.83	.....	3.57	6.65	5.35	3.92	3.29	3.50	3.06
2	6.0	3.75	3.45	3.83	.....	3.78	8.65	4.40	4.38	3.43	3.39	3.22
3	5.6	3.6	3.45	4.10	.....	3.85	11.3	5.35	4.03	3.43	3.35	3.10
4	.....	3.65	3.20	.....	3.72	3.74	13.6	4.07	.....	3.56	3.08	3.22
5	4.8	3.6	3.8	.....	3.66	3.58	14.3	5.4	3.87	3.22	3.16	3.38
6	4.5	3.7	.....	.....	3.44	3.13	15.5	4.22	3.74	3.41	.....	3.25
7	4.9	3.65	.....	.....	.....	3.09	14.8	5.0	3.84	3.32	.....	3.40
8	4.6	3.7	3.25	.....	.....	3.19	12.4	4.79	3.71	3.17	.....	3.42
9	4.6	3.7	3.45	.....	.....	3.32	11.8	4.69	4.01	3.23	.....	3.34
10	4.4	3.6	3.6	.....	.....	3.62	10.4	4.73	3.65	3.16	.....	3.32
11	4.3	3.7	3.15	.....	.....	3.76	10.8	4.59	3.65	3.29	.....	3.64
12	4.4	3.7	3.45	.....	.....	3.69	9.5	4.73	3.66	3.24	.....	3.61
13	3.9	3.7	3.8	.....	.....	3.59	9.1	4.59	3.58	3.32	3.81	3.55
14	4.3	.....	3.0	.....	.....	3.73	8.7	4.63	3.52	3.19	3.42	3.75
15	4.1	3.85	3.45	.....	.....	3.84	9.1	4.61	3.43	3.26	3.30	3.72
16	4.3	3.8	3.25	.....	.....	4.18	9.5	4.36	3.71	3.54	3.34	3.62
17	4.0	3.6	3.25	.....	.....	3.39	9.0	4.56	.....	3.52	3.60	3.60
18	4.6	3.7	3.55	.....	.....	3.62	8.4	4.54	3.63	3.79	3.52	3.63
19	4.0	.....	3.35	.....	.....	3.58	9.0	4.67	3.66	3.86	3.26	3.42
20	3.65	.....	3.1	.....	.....	3.56	7.2	4.54	3.75	3.74	3.16	3.56
21	3.75	3.75	3.4	.....	3.39	3.53	7.2	4.37	3.87	3.56	.....	3.62
22	3.8	3.5	3.4	.....	3.24	3.66	6.6	3.94	3.62	3.42	.....	3.32
23	3.6	3.35	3.7	.....	4.02	3.95	6.2	4.02	3.35	3.35	3.62	3.32
24	3.7	.....	3.55	.....	3.38	3.62	5.9	3.79	3.20	3.44	3.13	3.40
25	3.85	2.85	3.6	.....	3.72	3.75	5.7	3.99	3.26	3.52	3.14	3.50
26	3.7	3.25	4.0	3.62	3.61	3.60	.....	3.81	3.42	3.23	3.07	3.26
27	3.6	2.87	3.7	3.44	3.40	3.62	5.85	3.93	3.76	3.42	3.14	3.26
28	3.65	2.86	3.65	3.68	3.40	3.52	5.85	4.15	3.45	3.46	3.46	3.05
29	3.65	3.45	3.8	3.63	.....	3.84	5.4	3.79	3.39	3.41	3.15	3.06
30	3.7	3.6	3.85	3.65	.....	4.24	4.45	3.94	3.24	3.36	3.22	3.22
31	3.8	.....	3.65	.....	.....	4.35	.....	4.11	.....	4.04	3.16	.....

NOTE.—Discharge relation affected by ice about Nov. 16, 1912, to Apr. 7, 1913.

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Daily discharge, in second-feet, of Red Lake River at Crookston, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,720	466	.....	.....	.....	.....	.....	1,230	464	229	299	161
2	1,590	448	.....	.....	.....	.....	.....	690	680	275	262	206
3	1,350	395	.....	.....	.....	.....	.....	1,230	513	275	248	171
4	a1,100	412	.....	.....	.....	.....	.....	531	a478	321	166	206
5	910	395	.....	.....	.....	.....	.....	1,260	442	206	188	258
6	760	430	.....	.....	.....	.....	.....	602	389	268	.....	216
7	965	412	.....	.....	.....	.....	.....	1,020	430	239	.....	265
8	810	430	.....	.....	.....	.....	6,220	900	377	191	.....	272
9	810	430	.....	.....	.....	.....	6,410	844	504	210	.....	245
10	715	395	.....	.....	.....	.....	5,240	866	354	188	.....	239
11	670	430	.....	.....	.....	.....	5,570	790	354	229	.....	350
12	715	430	.....	.....	.....	.....	4,480	866	358	213	.....	339
13	502	430	.....	.....	.....	.....	4,1a0	790	328	239	417	317
14	670	a450	.....	.....	.....	.....	3,810	812	306	197	272	393
15	580	484	.....	.....	.....	.....	4,1a0	800	275	219	232	381
16	670	.....	.....	.....	.....	.....	4,480	670	377	313	245	343
17	540	.....	.....	.....	.....	.....	4,060	773	a362	306	335	335
18	810	.....	.....	.....	.....	.....	3,600	762	346	409	306	346
19	540	.....	.....	.....	.....	.....	4,060	834	358	438	219	272
20	412	.....	.....	.....	.....	.....	2,560	762	393	389	188	321
21	448	.....	.....	.....	.....	.....	2,560	675	442	321	a240	343
22	466	.....	.....	.....	.....	.....	2,100	473	343	272	a292	239
23	395	.....	.....	.....	.....	.....	1,800	508	248	248	343	239
24	430	.....	.....	.....	.....	.....	1,590	409	200	279	180	265
25	484	.....	.....	.....	.....	.....	1,460	495	219	306	183	299
26	430	.....	.....	.....	.....	.....	a1,510	417	272	210	163	219
27	395	.....	.....	.....	.....	.....	1,560	468	397	272	183	219
28	412	.....	.....	.....	.....	.....	1,560	568	282	285	285	158
29	412	.....	.....	.....	.....	.....	1,260	409	262	268	186	161
30	430	.....	.....	.....	.....	.....	715	473	213	252	206	206
31	466	.....	.....	.....	.....	.....	.....	550	.....	517	188	.....

a Discharge estimated.

NOTE.—Daily discharge Oct. 1 to Nov. 15, 1912, computed from a fairly well defined rating curve. Discharge Apr. 8 to Sept. 30, 1913, computed from a rating curve well defined between 155 and 6,580 second-feet (gage heights 3.0 and 12.0 feet), and fairly well defined beyond those points.

Discharge estimated, because of ice, from gage heights, observer's notes, four discharge measurements, and climatic records, as follows: Nov. 16–30, 295 second-feet; Dec. 1–31, 165 second-feet; Jan. 1–15, 145 second-feet; Jan. 16–31, 130 second-feet; Feb. 1–15, 130 second-feet; Feb. 16–28, 120 second-feet; Mar. 1–15, 115 second-feet; Mar. 16–31, 120 second-feet; and Apr. 1–7, 3,560 second-feet. Discharge Aug. 6–12, 1913, estimated 300 second-feet.

Monthly discharge of Red Lake River at Crookston, Minn., for the year ending Sept. 30, 1913.

Month.	Discharge in second-feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
October	1,720	395	697	B.
November	484	.....	362	C.
December	.....	.....	165	C.
January	.....	.....	137	D.
February	.....	.....	125	D.
March	.....	.....	118	D.
April	.....	.....	3,350	C.
May	1,260	409	725	A.
June	680	200	366	B.
July	517	188	277	B.
August	.....	.....	256	B.
September	393	158	266	C.
The year	.....	.....	568	

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THIEF RIVER NEAR THIEF RIVER FALLS, MINN.

Location.—In sec. 3, T. 154 N., R. 43 W., at the Drybrooke ford, 6 miles north of Thief River Falls. The nearest tributary is the outlet of Mud Lake, which enters Thief River in the northeastern part of T. 156 N., R. 42 W.

Records available.—July 1, 1909, to September 30, 1913.

Drainage area.—1,010 square miles.

Gage.—Inclined staff; read daily, morning and evening, to quarter-tenths. Limits of use: Hundredths below 5.5, half-tenths from 5.5 to 6.5, and tenths above 6.5 feet. On September 4, 1913, the old inclined staff gage which was in error was replaced by a new gage set at the correct datum. See Water-Supply Paper 325 for the history of the old gage. All gage heights in the following tables subsequent to December 31, 1912, refer to the original gage datum.

Channel and control.—Practically permanent.

Discharge measurements.—Made by means of a boat and cable a short distance below gage.

Winter flow.—Determined by measurements. River frozen over from middle of November to first of April.

Regulation.—The dam at Thief River Falls, at the mouth of Thief River, backs up the water in Thief River for several miles, but the station is protected by the rapids below from the influence of the dam. During 1910 and 1911 drainage work has been carried on extensively in Thief River basin and the effect will be to modify the regimen of the river. The extremely low flow of 1910 and 1911 was due partly to the holding back of the run-off by temporary dams for use of the floating dredges above the station.

Accuracy.—See remarks under "Gage," and footnote to daily-discharge table.

Discharge measurements of Thief River near Thief River Falls, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 21	W. B. Stevenson.....	5.00	[a] 16.7	Aug. 14	E. F. Chandler.....	4.10	[c] 12.0
Apr. 10	E. J. Budge.....	7.96	[b] 895	Sept. 4	W. B. Stevenson.....	4.00	[c] 7.3

[a] Measurement made under partial ice cover.
[b] Ice not entirely out; some ice running.
[c] Measurement made by wading at a section 100 feet above gage.

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Daily gage height, in feet, of Thief River near Thief River Falls, Minn., for the year ending Sept. 30, 1913.

[H. J. Maland, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4.84	5.10	.....	.....	.....	.....	6.45	5.30	4.75	3.75	3.95	4.00
2	4.72	4.80	.....	.....	.....	.....	6.65	5.20	4.85	3.75	4.25	4.00
3	4.76	4.77	.....	.....	.....	.....	8.0	5.20	4.75	3.90	4.18	4.05
4	4.74	4.70	.....	.....	.....	.....	9.7	5.20	4.70	4.05	4.05	4.00
5	4.65	4.65	4.30	.....	.....	.....	11.0	5.15	4.60	4.15	3.98	.....
6	4.70	4.60	.....	.....	.....	.....	13.0	5.10	4.55	4.22	3.98	.....
7	4.77	4.07	.....	.....	.....	.....	14.0	[a]4.60	4.65	4.28	3.98	.....
8	4.76	4.75	.....	.....	.....	.....	11.0	5.45	4.60	4.52	3.98	.....
9	4.70	4.67	.....	.....	.....	.....	9.0	5.25	4.60	4.10	3.98	.....
10	4.80	4.70	.....	.....	.....	.....	8.7	5.20	4.55	3.80	3.98	4.15
11	4.75	4.70	.....	.....	.....	.....	8.0	5.15	4.65	3.95	3.98	4.10
12	4.70	4.67	.....	.....	.....	.....	8.0	5.15	4.65	4.30	3.98	4.10
13	4.70	4.65	.....	.....	.....	.....	8.0	5.10	4.60	4.35	4.12	4.05
14	4.65	4.65	.....	.....	.....	.....	8.0	5.15	4.60	4.42	4.10	4.02
15	4.63	4.77	.....	.....	.....	.....	8.7	5.15	4.10	4.48	4.10	4.12
16	4.60	4.90	.....	.....	.....	.....	8.4	5.10	3.75	4.58	4.10	4.18
17	4.59	4.77	.....	.....	.....	.....	8.0	5.10	4.35	4.58	4.10	4.16
18	4.32	4.75	.....	.....	.....	.....	7.8	5.00	4.40	4.50	4.05	4.15
19	4.65	5.0	.....	.....	.....	.....	7.6	5.00	4.40	4.45	4.08	4.10
20	4.65	4.65	.....	.....	.....	.....	6.9	5.00	4.40	4.38	4.10	4.10
21	4.73	4.73	5.00	.....	.....	.....	6.3	5.00	4.40	4.40	4.08	4.10
22	4.57	4.87	.....	.....	.....	.....	6.05	5.00	4.35	4.35	4.10	4.10
23	4.13	4.77	.....	.....	.....	.....	5.95	4.95	4.35	4.28	4.10	4.10
24	4.38	4.65	.....	.....	.....	.....	5.65	4.95	4.25	3.80	4.05	4.14
25	5.15	4.58	.....	.....	.....	.....	5.35	5.00	4.60	3.75	4.05	4.15
26	4.80	4.62	.....	.....	.....	.....	5.35	5.00	4.60	3.65	4.00	4.10
27	4.55	4.60	.....	.....	.....	.....	5.30	5.00	4.10	3.75	4.00	4.10
28	4.69	.....	.....	.....	.....	.....	5.30	5.00	4.88	4.18	4.00	4.11
29	4.72	.....	.....	.....	.....	.....	5.40	4.90	4.25	4.18	4.00	4.12
30	4.57	.....	.....	.....	.....	.....	5.30	4.90	3.80	4.08	4.05	4.12
31	4.70	.....	.....	.....	.....	.....	.....	4.85	.....	3.98	4.00	.....

[a] Gage height probably 1 foot too low.

NOTE.—Discharge relation affected by ice about Nov. 16, 1912, to Apr. 10, 1913. See "Gage" in station description.

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Daily discharge, in second-feet, of Thief River near Thief River Falls, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	55	84	.....	.....	.....	.....	.....	159	46	2.6	6.2	7.3
2	45	51	.....	.....	.....	.....	.....	134	61	2.6	14	7.3
3	48	49	.....	.....	.....	.....	.....	134	46	5.2	12	8.5
4	46	43	.....	.....	.....	.....	.....	134	40	8.5	8.5	7.3
5	39	39	.....	.....	.....	.....	.....	122	30	11	6.9	.....
6	43	35	.....	.....	.....	.....	.....	110	26	13	6.9	.....
7	49	6.9	.....	.....	.....	.....	.....	a 239	35	15	6.9	.....
8	48	47	.....	.....	.....	.....	.....	198	30	24	6.9	.....
9	43	41	.....	.....	.....	.....	.....	146	30	9.7	6.9	.....
10	51	43	.....	.....	.....	.....	.....	134	26	3.4	6.9	11
11	47	43	.....	.....	.....	.....	1,000	122	35	6.2	6.9	9.7
12	43	41	.....	.....	.....	.....	1,000	122	35	16	6.9	9.7
13	43	39	.....	.....	.....	.....	1,000	110	30	17	10	8.5
14	39	39	.....	.....	.....	.....	1,000	122	30	20	9.7	7.8
15	37	49	.....	.....	.....	.....	1,250	122	9.7	22	9.7	10
16	35	.....	.....	.....	.....	.....	1,140	110	2.6	29	9.7	12
17	34	.....	.....	.....	.....	.....	1,000	110	17	29	9.7	11
18	18	.....	.....	.....	.....	.....	935	88	19	23	8.5	11
19	39	.....	.....	.....	.....	.....	865	88	19	21	9.2	9.7
20	39	.....	.....	.....	.....	.....	622	88	19	18	9.7	9.7
21	45	.....	.....	.....	.....	.....	437	88	19	19	9.2	9.7
22	33	.....	.....	.....	.....	.....	364	88	17	17	9.7	9.7
23	8.8	.....	.....	.....	.....	.....	336	78	17	15	9.7	9.7
24	21	.....	.....	.....	.....	.....	252	78	14	3.4	8.5	11
25	90	.....	.....	.....	.....	.....	172	88	30	2.6	8.5	11
26	51	.....	.....	.....	.....	.....	172	88	30	1.3	7.3	9.7
27	32	.....	.....	.....	.....	.....	159	88	9.7	2.6	7.3	9.7
28	42	.....	.....	.....	.....	.....	159	88	66	12	7.3	10
29	45	.....	.....	.....	.....	.....	185	69	14	12	7.3	10
30	33	.....	.....	.....	.....	.....	159	69	3.4	9.2	8.5	10
31	43	.....	.....	.....	.....	.....	.....	61	.....	6.9	7.3	.....

a Estimated.

NOTE.—Daily discharge computed from two fairly well defined rating curves. Daily gage height and the rating curve used prior to 1913 refer to the old gage, which was slightly in error. The rating curve used beginning Apr. 11, 1913, refers to the new gage. Discharge estimated, because of ice, from observer's notes, one discharge measurement, and climatic records as follows: Nov. 16–30, 22 second-feet; Dec. 1–31, 1912, 14 second-feet; Jan. 1–15, 1913, 13 second-feet; Jan. 16–31, 8 second-feet; Feb. 1–15, 6 second-feet; Feb. 16–28, 12 second-feet; Mar. 1–15, 6 second-feet; Mar. 16–31, 8-second-feet; and Apr. 1–10, 750 second-feet.

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Monthly discharge of Thief River near Thief River Falls, Minn., for the year ending Sept. 30, 1913.

Month.	Discharge in second-feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
October	90	8.8	41.4	B.
November	84	.....	32.7	C.
December	.....	.....	14	
January	.....	.....	10	
February	.....	.....	9	
March	.....	.....	7	
April	.....	.....	657	C.
May	239	61	112	B.
June	66	2.6	26.9	B.
July	29	1.3	12.8	C.
August	14	6.2	8.47	C.
September	.....	.....	9.53	C.
The year	.....	.....	77.9	

NOTE.—See "Accuracy" in station description.

CLEARWATER RIVER AT RED LAKE FALLS, MINN.

Location.—At Great Northern Railway bridge at Red Lake Falls, Minn., about 1½ miles above mouth of river and 2 miles below nearest tributary.

Records available.—June 18, 1909, to September 30, 1913.

Drainage area.—1,310 square miles.

Gage.—Vertical staff, installed September 12, 1911, about half a mile farther downstream than the original gage, as the building of a dam will cause several feet of backwater at the original section. Gage read morning and evening to tenths. Limits of use: Half-tenths below and tenths above 4.5 feet. The new gage was set to read 2.23 feet when the original gage read 5.83 feet. Owing to the fact that the new gage is at a different section, measurements referred to the old gage can not be used in rating the new section.

Channel and control.—Practically permanent.

Discharge measurements.—Made from railroad bridge or by wading.

Winter flow.—Determined by measurements made through the ice; river usually frozen over from middle of November to first of April.

Accuracy.—Discharge measurement made September 13, 1911, indicates that the estimates for September and October, 1911, as published in Water-Supply Paper 305, are too large; following tables probably more accurate. Backwater from the Healy dam on Red Lake River may slightly affect the discharge relation at this new site if flashboards are put in place at the Healy dam.

Discharge measurements of Clearwater River at Red Lake Falls, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 18	E. J. Budge	2.79	215	Apr. 21	Ole Christianson	4.27	871
Dec. 20	W. B. Stevenson	3.01	a 45	29	E. F. Chandler	3.52	544
Feb. 11	E. J. Budge	4.40	a 27.3	29	.....do.....	3.51	557
Apr. 11	.....do.....	5.30	1,930	Aug. 13	.....do.....	2.28	87

a River frozen over.

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Daily gage height, in feet, of Clearwater River at Red Lake Falls, Minn., for the year ending Sept. 30, 1913.

[Leo Steinert, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4.4	2.3	2.6	.....	.....	.....	6.8	3.4	2.65	2.4	2.25	2.0
2	4.6	2.25	2.6	.....	.....	.....	8.2	3.35	2.7	2.4	2.25	2.3
3	4.0	2.2	2.7	.....	.....	.....	10.2	3.2	2.65	2.5	2.25	2.35
4	3.7	2.25	2.55	3.1	.....	.....	10.2	3.2	2.6	2.5	2.25	2.25
5	3.4	2.3	2.7	.....	.....	.....	14.4	3.3	2.6	2.5	2.25	2.35
6	3.4	2.3	2.45	.....	.....	.....	15.0	3.3	2.6	2.5	2.3	1.95
7	3.4	2.3	2.55	.....	.....	.....	6.8	3.3	2.6	2.4	2.25	1.95
8	3.2	2.3	2.8	.....	.....	.....	6.4	3.3	2.6	2.4	2.25	2.25
9	3.1	2.25	2.35	.....	.....	.....	5.6	3.3	2.6	2.35	2.25	2.05
10	3.0	2.2	3.5	.....	.....	.....	5.4	3.3	2.6	2.35	2.25	2.25
11	3.1	2.3	3.15	.....	.....	.....	5.2	3.15	2.6	2.35	2.25	2.3
12	3.2	2.3	3.15	.....	.....	.....	5.0	3.05	2.55	2.35	2.3	2.4
13	3.2	2.3	3.15	.....	.....	.....	5.0	3.0	2.45	2.35	2.35	2.5
14	3.2	2.3	3.1	.....	.....	.....	5.0	3.05	2.4	2.35	2.25	2.45
15	3.05	2.3	3.0	.....	.....	.....	5.2	3.05	2.4	2.35	2.25	2.4
16	2.9	2.3	3.15	.....	.....	.....	5.2	3.05	2.4	2.4	2.25	2.4
17	2.9	2.0	3.3	.....	.....	.....	5.1	3.05	2.4	2.55	2.25	2.25
18	3.0	2.0	3.25	.....	.....	.....	4.8	2.95	2.4	2.45	2.25	2.4
19	3.0	2.0	3.35	.....	.....	.....	4.6	2.95	2.4	2.4	2.25	2.4
20	3.1	2.0	3.05	.....	.....	.....	4.35	2.95	2.4	2.35	2.25	2.4
21	3.1	1.9	3.1	.....	.....	.....	4.25	2.85	2.35	2.35	2.35	2.15
22	3.2	1.9	.....	.....	.....	.....	4.05	2.85	2.35	2.35	2.35	2.4
23	3.2	1.8	.....	.....	.....	.....	3.85	2.85	2.35	2.35	2.35	2.4
24	2.95	2.3	.....	.....	.....	.....	3.8	2.85	2.3	2.35	2.35	2.35
25	2.25	2.4	.....	.....	.....	.....	3.7	2.75	2.35	2.25	2.0	2.3
26	2.2	2.3	.....	.....	.....	.....	3.65	2.75	2.25	2.25	2.25	2.25
27	2.2	2.5	.....	.....	.....	.....	3.65	2.75	2.25	2.25	2.25	2.25
28	2.2	2.8	3.05	.....	.....	.....	3.55	2.7	2.35	2.25	2.30	2.25
29	2.15	2.6	.....	.....	.....	.....	3.5	2.65	2.25	2.25	2.35	2.25
30	2.4	2.15	.....	.....	.....	.....	3.45	2.6	2.35	2.25	2.35	2.25
31	2.35	.....	.....	.....	.....	.....	.....	2.5	.....	2.25	2.35	.....

NOTE.—Discharge relation affected by ice about Nov. 16, 1912, to Apr. 7, 1913.

91388°—WSP 355—15——4

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Daily discharge, in second-feet, of Clearwater River at Red Lake Falls, Minn., for the period Sept. 12, 1911, to Sept. 30, 1913.

Day.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1911-12.													
1	.....	63	58	.....	.....	.....	.....	.....	196	126	63	115	54
2	.....	74	88	.....	.....	.....	.....	.....	180	126	63	115	58
3	.....	81	166	.....	.....	.....	.....	.....	180	151	63	96	126
4	.....	81	74	.....	.....	.....	.....	.....	196	151	63	68	115
5	.....	81	68	.....	.....	.....	.....	.....	213	138	63	68	81
6	.....	81	77	.....	.....	.....	.....	.....	249	115	54	68	54
7	.....	88	77	.....	.....	.....	.....	.....	268	126	54	63	50
8	.....	74	81	.....	.....	.....	.....	.....	309	151	54	63	46
9	.....	81	88	.....	.....	.....	.....	.....	309	115	54	[a] 63	46
10	.....	81	88	.....	.....	.....	.....	.....	309	96	68	63	46
11	.....	74	.....	.....	.....	.....	.....	.....	309	88	88	63	54
12	63	74	.....	.....	.....	.....	.....	.....	330	96	74	63	68
13	72	74	.....	.....	.....	.....	.....	693	375	96	104	63	180
14	68	77	.....	.....	.....	.....	.....	603	352	81	213	63	352
15	58	88	.....	.....	.....	.....	.....	352	352	104	213	[a] 63	352
16	68	88	.....	.....	.....	.....	.....	268	309	115	213	63	375
17	74	88	.....	.....	.....	.....	.....	249	268	115	213	63	352
18	58	101	.....	.....	.....	.....	.....	213	268	115	213	63	330
19	74	58	.....	.....	.....	.....	.....	196	268	138	213	63	309
20	74	74	.....	.....	.....	.....	.....	180	231	126	180	63	268
21	68	74	.....	.....	.....	.....	.....	180	213	126	151	68	288
22	74	104	.....	.....	.....	.....	.....	151	231	[a] 104	166	96	126
23	74	58	.....	.....	.....	.....	.....	151	213	81	213	63	231
24	74	74	.....	.....	.....	.....	.....	151	180	81	.....	63	604
25	74	81	.....	.....	.....	.....	.....	126	180	81	.....	63	663
26	74	74	.....	.....	.....	.....	.....	151	196	81	.....	63	663
27	74	88	.....	.....	.....	.....	.....	126	196	96	.....	63	963
28	74	88	.....	.....	.....	.....	.....	213	166	88	.....	63	1,110
29	74	81	.....	.....	.....	.....	.....	196	151	81	.....	81	1,110
30	74	88	.....	.....	.....	.....	.....	180	126	68	.....	63	1,040
31	.....	88	.....	.....	.....	.....	.....	.....	138	.....	.....	54	.....

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1912-13.												
1	1,110	88	.....	.....	.....	.....	.....	471	166	104	81	54
2	1,270	81	.....	.....	.....	.....	.....	446	180	104	81	88
3	822	74	.....	.....	.....	.....	.....	375	166	126	81	96
4	633	81	.....	.....	.....	.....	.....	375	151	126	81	81
5	471	88	.....	.....	.....	.....	.....	422	151	126	81	96
6	471	88	.....	.....	.....	.....	.....	422	151	126	88	50
7	471	88	.....	.....	.....	.....	.....	422	151	104	81	50
8	375	88	.....	.....	.....	.....	2,870	422	151	104	81	81
9	330	81	.....	.....	.....	.....	2,150	422	151	96	81	58
10	288	74	.....	.....	.....	.....	1,970	422	151	96	81	81
11	330	88	.....	.....	.....	.....	1,790	352	151	96	81	88
12	375	88	.....	.....	.....	.....	1,610	309	138	96	88	104
13	375	88	.....	.....	.....	.....	1,610	288	115	96	96	126
14	375	88	.....	.....	.....	.....	1,610	309	104	96	81	115
15	309	88	.....	.....	.....	.....	1,790	309	104	96	81	104
16	249	.....	.....	.....	.....	.....	1,790	309	104	104	81	104
17	249	.....	.....	.....	.....	.....	1,700	300	104	138	81	81
18	288	.....	.....	.....	.....	.....	1,440	268	104	115	81	104
19	288	.....	.....	.....	.....	.....	1,270	268	104	104	81	104
20	330	.....	.....	.....	.....	.....	1,080	268	104	96	81	104
21	330	.....	.....	.....	.....	.....	1,000	231	96	96	96	68
22	375	.....	.....	.....	.....	.....	856	231	96	96	96	104
23	375	.....	.....	.....	.....	.....	724	231	96	96	96	104
24	268	.....	.....	.....	.....	.....	693	231	88	96	96	96
25	81	.....	.....	.....	.....	.....	633	196	96	81	54	88
26	74	.....	.....	.....	.....	.....	604	196	81	81	81	81
27	74	.....	.....	.....	.....	.....	604	196	81	81	81	81
28	74	.....	.....	.....	.....	.....	549	180	96	81	88	81
29	68	.....	.....	.....	.....	.....	522	166	81	81	96	81
30	104	.....	.....	.....	.....	.....	496	151	96	81	96	81
31	96	.....	.....	.....	.....	.....	.....	126	.....	81	96	.....

[a] Discharge estimated on account of backwater from Healy's dam.

NOTE.—Daily discharge computed from a rating curve well defined between 63 and 522 second-feet (gage heights, 2.1 and 3.5 feet) and fairly well defined between 576 and 2,510 second-feet (gage heights, 3.6 and 6.0 feet). Discharge estimated, because of ice, from observer's notes, discharge measurements, and climatic records, as follows: Nov. 11-30, 1911, 70 second-feet; Dec. 1-31, 1911, 65 second-feet; Jan. 1-31, 1912, 30 second-feet; Feb. 1-29, 35 second-feet; Mar. 1-31, 38 second-feet; Apr. 1-12, 420 second-feet; Nov. 16-30, 75 second-feet; Dec. 1-31, 1912, 60 second-feet; Jan. 1-15, 1913, 38 second-feet; Jan. 16-31, 32 second-feet; Feb. 1-15, 28 second-feet; Feb. 16-28, 30 second-feet; Mar. 1-15, 30 second-feet; Mar. 16-31, 35 second-feet; and Apr. 1-7, 1913, 1,340 second-feet. Discharge, July 24-31, 1912, estimated on account of backwater from Healy's dam at 170 second-feet.

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Monthly discharge of Clearwater River at Red Lake Falls, Minn., from Sept. 12, 1911, to Sept. 30, 1913.

[Drainage area, 1,310 square miles.] [a]

Month.	Discharge in second-feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
1911.				
September 12–30	74	58	70.7	B.
1912.				
October	104	58	80.0	B.
November			75.5	C.
December			65	D.
January			30	D.
February			35	D.
March			38	C.
April		126	317	C.
May	375	126	241	A.
June	151	68	109	A.
July		54	136	B.
August	115	54	69.4	B.
September	1,110	46	337	B.
The year			127	
1913.				
October	1,270	68	365	A.
November			79.9	C.
December			60	C.
January			34.9	C.
February			28.9	C.
March			32.6	C.
April			1,290	B.
May	471	126	301	A.
June	180	81	120	A.
July	138	81	100	A.
August	96	54	84.7	A.
September	126	50	87.8	B.
The year			215	

[a] Estimates of "run-off in second-feet per square mile" and "run-off (depth in inches on drainage area)" omitted because of the large amount of swamp land (some of which is being drained artificially) in the area above this station.

SOUTH BRANCH OF TWO RIVERS AT HALLOCK, MINN.

Location.—In sec. 12, T. 161 N., R. 49 W., at private wagon bridge on farm of John Ross, half a mile north of Hallock; a mile below the nearest tributary, a small creek that enters from the west.

Records available.—April 29, 1911, to September 30, 1913.

Drainage area.—776 square miles.

Gage.—Vertical staff; read daily, morning and afternoon, to tenths. Occasional readings taken to half-tenths. Limits of use: Hundredths below 2.5, half-tenths from 2.5 to 4.0, and tenths above 4.0 feet.

Channel and control.—Probably permanent. The control is an abandoned loose-rock dam 4 feet high, a mile or more below the station. The dam was formerly used to raise the water level for a railroad water tank.

Discharge measurements.—Made from the bridge.

Winter flow.—River frozen over from November to April; gage readings discontinued.

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Discharge measurements of South Branch of Two Rivers at Hallock, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 14	E. J. Budge	13.51	[a] 1,090	Aug. 23	E. F. Chandler	1.96	[b] 23.5
30	do	4.58	190	Sept. 3	W. B. Stevenson	1.51	[b] 3.1

[a] Some ice running.
[b] Measurement made by wading at a section above the gage.

Daily gage height, in feet, of South Branch of Two Rivers at Hallock, Minn., for the year ending Sept. 30, 1913.

[W. P. Willardson, observer.]

Day.	Oct.	Nov.	Dec	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4.3	2.9	.....	.....	.....	.....	4.4	4.2	2.1	1.45	1.3	1.6
2	4.3	2.9	.....	.....	.....	.....	9.7	4.0	2.1	1.45	1.25	1.55
3	4.5	2.9	.....	.....	.....	.....	11.3	3.8	2.1	1.45	1.25	1.55
4	4.6	3.0	.....	.....	.....	.....	11.3	3.8	2.05	1.45	1.25	1.55
5	4.6	3.0	.....	.....	.....	.....	11.0	3.8	2.05	1.45	1.25	1.5
6	4.6	2.9	.....	.....	.....	.....	11.9	3.8	2.0	1.45	1.25	1.5
7	4.7	2.9	.....	.....	.....	.....	13.2	3.8	1.95	1.45	1.2	1.5
8	4.4	3.0	.....	.....	.....	.....	15.0	3.7	1.9	1.42	1.2	1.45
9	4.2	3.0	.....	.....	.....	.....	15.2	3.6	1.9	1.4	1.2	1.4
10	4.0	3.0	.....	.....	.....	.....	15.6	3.4	1.9	1.4	1.15	1.7
11	3.9	3.0	.....	.....	.....	.....	15.8	3.3	1.85	1.6	1.4	1.7
12	3.8	2.9	.....	.....	.....	.....	15.3	3.2	1.8	1.6	1.45	1.7
13	3.6	2.8	.....	.....	.....	.....	14.6	3.05	1.75	1.65	1.55	1.65
14	3.4	2.8	.....	.....	.....	.....	13.6	2.95	1.75	1.65	1.52	1.62
15	3.4	2.8	.....	.....	.....	.....	12.6	2.9	1.7	1.65	1.72	1.6
16	3.1	2.8	.....	.....	.....	.....	11.5	2.85	1.65	1.6	1.65	1.6
17	3.0	2.8	.....	.....	.....	.....	10.0	2.8	1.6	1.58	1.7	1.75
18	2.9	2.8	.....	.....	.....	.....	8.4	2.75	1.6	1.6	1.68	1.95
19	2.8	2.8	.....	.....	.....	.....	7.5	2.7	1.6	1.6	1.6	2.15
20	2.8	2.8	.....	.....	.....	.....	6.8	2.6	1.6	1.55	1.9	2.2
21	2.8	2.6	.....	.....	.....	.....	6.4	2.55	1.6	1.5	2.7	2.2
22	2.65	2.5	.....	.....	.....	.....	5.9	2.5	1.6	1.45	2.15	2.1
23	2.6	2.45	.....	.....	.....	.....	5.7	2.45	1.65	1.45	1.95	2.1
24	2.6	2.2	.....	.....	.....	.....	5.9	2.4	1.6	1.45	1.85	2.0
25	2.4	2.2	.....	.....	.....	.....	6.0	2.35	1.55	1.4	1.85	1.92
26	2.4	2.1	.....	.....	.....	.....	5.6	2.3	1.5	1.4	1.8	1.88
27	2.4	2.1	.....	.....	.....	.....	5.4	2.25	1.5	1.35	1.8	1.8
28	2.4	2.2	.....	.....	.....	.....	5.1	2.2	1.5	1.35	1.78	1.78
29	2.6	2.2	.....	.....	.....	.....	4.8	2.2	1.5	1.35	1.72	1.75
30	2.6	2.3	.....	.....	.....	.....	4.6	2.2	1.5	1.35	1.68	1.82
31	2.8	.....	.....	.....	.....	.....	.....	2.15	.....	1.3	1.62	.....

NOTE.—Discharge relation affected by ice about Nov. 16, 1912, to Apr. 12, 1913.

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Daily discharge, in second-feet, of South Branch of Two Rivers at Hallock, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	179	69	.....	.....	.....	.....	.....	170	31	6.5	3.0	6.2
2	179	69	.....	.....	.....	.....	.....	154	31	6.5	2.0	4.4
3	197	69	.....	.....	.....	.....	.....	138	31	6.5	2.0	4.5
4	206	76	.....	.....	.....	.....	.....	138	28	6.5	2.0	4.5
5	206	76	.....	.....	.....	.....	.....	138	28	6.5	2.0	3.0
6	206	69	.....	.....	.....	.....	.....	138	26	6.5	2.0	3.0
7	215	69	.....	.....	.....	.....	.....	138	24	6.5	1.0	3.0
8	188	76	.....	.....	.....	.....	.....	130	22	5.6	1.0	2.0
9	170	76	.....	.....	.....	.....	.....	122	22	5.0	1.0	1.0
10	152	76	.....	.....	.....	.....	.....	108	22	5.0	.7	9.0
11	144	76	.....	.....	.....	.....	.....	101	20	11	5.0	9.0
12	136	69	.....	.....	.....	.....	.....	94	18	11	6.5	9.0
13	120	63	.....	.....	.....	.....	1,200	84	16	12	9.5	7.5
14	104	63	.....	.....	.....	.....	1,100	77	16	12	8.6	6.6
15	104	63	.....	.....	.....	.....	1,000	74	14	12	15	6.0
16	83	.....	.....	.....	.....	.....	890	71	12	11	12	6.0
17	76	.....	.....	.....	.....	.....	740	68	11	10	14	10
18	69	.....	.....	.....	.....	.....	580	65	11	11	13	17
19	63	.....	.....	.....	.....	.....	490	62	11	11	11	25
20	63	.....	.....	.....	.....	.....	420	56	11	9.5	22	27
21	63	.....	.....	.....	.....	.....	380	54	11	8.0	62	27
22	54	.....	.....	.....	.....	.....	330	51	11	6.5	34	23
23	51	.....	.....	.....	.....	.....	310	48	12	6.5	24	23
24	51	.....	.....	.....	.....	.....	330	46	11	6.5	19	19
25	39	.....	.....	.....	.....	.....	340	44	9.5	5.0	18	16
26	39	.....	.....	.....	.....	.....	300	41	8.0	5.0	16	14
27	39	.....	.....	.....	.....	.....	280	38	8.0	4.0	15	12
28	39	.....	.....	.....	.....	.....	250	36	8.0	4.0	14	11
29	51	.....	.....	.....	.....	.....	222	36	8.0	4.0	11	10
30	51	.....	.....	.....	.....	.....	204	36	8.0	4.0	9.5	13
31	63	.....	.....	.....	.....	.....	.....	34	.....	3.0	7.1	.....

NOTE.—Daily discharge determined as follows: Oct. 1 to Nov. 15, 1912, and Apr. 13 to Sept. 30, 1913, from two fairly well defined rating curves, new rating curve beginning Sept. 3, 1913; Aug. 24 to Sept. 2, 1913, by the indirect method for shifting channels.

Discharge estimated, because of ice, by Prof. E. F. Chandler, from climatic records, discharge of adjacent drainage areas, and observer's reports on marked variation in discharge, as follows: Jan. 1–15, 4 second-feet; Jan. 16–31, 2 second-feet; Feb. 1–28, 2 second-feet; Mar. 1–15, 2 second-feet; Mar. 16–31, 5 second-feet. Data on which these estimates are based are less complete than similar estimates at most stations in this report, but they represent the best available information. Discharge estimated, because of ice, from daily gage height, climatic records, and discharge of adjacent areas, as follows: Nov. 16–30, 30 second-feet, varying from about 57 to 10 second-feet; Dec. 1–31, 1912, 15 second-feet; and Apr. 1–12, 1913, 820 second-feet.

Monthly discharge of South Branch of Two Rivers at Hallock, Minn., for the year ending Sept. 30, 1913.

Month.	Discharge in second-feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
October	215	39	110	B.
November	76	.....	50.3	C.
December	.....	.....	15	
January	.....	.....	3	
February	.....	.....	2	
March	.....	.....	4	
April	.....	.....	640	C.
May	170	34	83.5	B.
June	31	8.0	16.6	B.
July	12	3.0	7.36	B.
August	62	.7	11.7	B.
September	27	1.0	11.1	D.
The year	.....	.....	79.0	

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PEMBINA RIVER AT NECHE, N. DAK.

Location.—At highway bridge 20 rods east of Great Northern Railway bridge two-thirds of a mile north of Neche, N. Dak.

Records available.—April 29, 1903, to September 30, 1913.

Drainage area.—2,940 square miles.

Gage.—Vertical staff in two sections for medium and low stage, attached to the abutment and a piling at north end of bridge. This gage was installed July 31, 1911. The original gage, which can be read at medium and high stage, is a vertical staff attached to the abutment of the railway bridge. The zeros of the two gages are at the same elevation; at low stage the slope of the water surface between the bridges is inappreciable; at highest stage the readings at the railway bridge would probably be from 0.03 to 0.06 foot greater than at the highway bridge.

Channel and control.—A loose-rock dam about one-third mile below the gage forms the control for this station. The channel consists of clay and silt and is slightly shifting.

Discharge measurements.—Made from the highway bridge. At very low stage made by wading at a section below the Great Northern dam.

Winter flow.—The ordinary winter discharge is less than the leakage through the dam, hence estimates can not be made from gage observations without numerous discharge measurements.

Regulation.—The water is raised at low stage from 1 to 2 feet at the gage by a loose-rock dam about 3 feet high one-third mile below, constructed to give sufficient depth of water for the intake of the Great Northern Railway water tank. Considerable water leaks through the dam, but the effect of this dam can not be precisely determined because it is liable to be changed by ice run or spring flood in any year. There are no reservoirs or power plants that affect the flow.

Accuracy.—On account of the varying effect of the dam at low stage, records not considered better than fair.

Discharge measurements of Pembina River at Neche, N. Dak., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 7	E. J. Budge	21.50	3,870
22	E. F. Chandler	10.05	1,320
Sept. 4	.....do	2.83	67

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Daily gage height, in feet, of Pembina River at Neche, N. Dak., for the year ending Sept. 30, 1913.

[P. J. Horgan and Mrs. M. Camden, observers.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4.0	4.6	.....	.....	.....	.....	.....	7.9	5.0	3.7	2.8	2.8
2	4.0	4.9	.....	.....	.....	.....	.....	7.7	4.9	3.7	2.8	2.8
3	4.1	4.6	.....	.....	.....	.....	8.5	7.4	4.9	3.6	2.8	2.8
4	4.0	4.5	.....	.....	.....	.....	12.2	7.5	4.8	3.6	2.8	2.8
5	4.0	4.4	.....	.....	.....	.....	16.0	7.4	4.8	3.5	2.8	2.8
6	4.1	4.3	.....	.....	.....	.....	19.5	7.3	4.7	3.5	2.8	2.8
7	4.0	4.2	.....	.....	.....	.....	21.2	7.2	4.7	3.5	2.8	2.8
8	4.0	4.0	.....	.....	.....	.....	21.4	7.1	4.6	3.4	2.8	2.8
9	4.1	4.0	.....	.....	.....	.....	20.0	6.9	4.5	3.4	2.8	2.8
10	4.1	4.0	.....	.....	.....	.....	18.2	6.8	4.4	3.3	2.8	2.8
11	4.2	4.2	.....	.....	.....	.....	14.5	6.6	4.2	3.3	2.8	2.8
12	4.2	4.7	.....	.....	.....	.....	13.0	6.5	4.1	3.2	2.8	2.8
13	4.1	4.7	.....	.....	.....	.....	13.2	6.4	4.0	3.2	2.8	2.8
14	4.0	4.7	.....	.....	.....	.....	13.4	6.3	3.9	3.2	2.8	2.7
15	4.0	4.7	.....	.....	.....	.....	13.4	6.2	3.8	3.2	2.8	2.7
16	4.0	4.7	.....	.....	.....	.....	12.9	6.1	3.7	3.3	2.8	2.7
17	4.0	4.7	.....	.....	.....	.....	12.9	6.0	3.5	3.3	2.9	2.7
18	4.0	4.7	.....	.....	.....	.....	12.5	5.9	3.2	3.3	2.9	2.7
19	4.0	4.5	.....	.....	.....	.....	12.0	5.8	3.0	3.3	3.0	2.7
20	4.0	4.5	.....	.....	.....	.....	11.6	5.7	2.8	3.3	3.0	2.7
21	4.0	4.5	.....	.....	.....	.....	11.0	5.5	2.6	3.2	3.0	2.7
22	4.0	4.5	.....	.....	.....	.....	10.2	5.4	2.8	3.1	2.9	2.7
23	4.0	4.5	.....	.....	.....	.....	9.8	5.3	3.0	3.0	2.9	2.7
24	4.0	.....	.....	.....	.....	.....	9.2	5.2	3.2	2.9	2.9	2.7
25	3.8	.....	.....	.....	.....	.....	9.0	5.2	3.5	2.8	2.9	2.7
26	3.8	.....	.....	.....	.....	.....	9.0	5.2	3.7	2.8	2.8	2.7
27	3.8	.....	.....	.....	.....	.....	8.8	5.2	3.8	2.8	2.8	2.7
28	3.7	.....	.....	.....	.....	.....	8.6	5.1	3.8	2.8	2.8	2.8
29	3.6	.....	.....	.....	.....	.....	8.2	5.0	3.8	2.8	2.8	2.8
30	3.6	.....	.....	.....	.....	.....	8.0	5.0	3.8	2.8	2.8	2.8
31	3.6	.....	.....	.....	.....	.....	.....	5.0	.....	2.8	2.8	.....

NOTE.—Discharge relation affected by ice about Nov. 1–6, and Nov. 12, 1912, to Apr. 6, 1913.

Daily discharge, in second-feet, of Pembina River at Neche, N. Dak., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	195	250	.....	.....	.....	.....	.....	850	330	159	66	66
2	195	300	.....	.....	.....	.....	.....	810	316	159	66	66
3	208	250	.....	.....	.....	.....	.....	750	316	147	66	66
4	195	240	.....	.....	.....	.....	.....	770	302	147	66	66
5	195	230	.....	.....	.....	.....	.....	750	302	136	66	66
6	208	230	.....	.....	.....	.....	.....	730	288	136	66	66
7	195	221	.....	.....	.....	.....	3,810	710	288	136	66	66
8	195	195	.....	.....	.....	.....	3,850	690	274	125	66	66
9	208	195	.....	.....	.....	.....	3,530	651	260	125	66	66
10	208	195	.....	.....	.....	.....	3,120	632	247	114	66	66
11	221	221	.....	.....	.....	.....	2,290	594	221	114	66	66
12	221	200	.....	.....	.....	.....	1,960	575	208	104	66	66
13	208	200	.....	.....	.....	.....	2,000	556	195	104	66	66
14	195	200	.....	.....	.....	.....	2,050	538	183	104	66	57
15	195	200	.....	.....	.....	.....	2,050	520	171	104	66	57
16	195	180	.....	.....	.....	.....	1,940	502	159	114	66	57
17	195	180	.....	.....	.....	.....	1,940	485	136	114	75	57
18	195	180	.....	.....	.....	.....	1,850	468	104	114	75	57
19	195	160	.....	.....	.....	.....	1,740	452	84	114	84	57
20	195	160	.....	.....	.....	.....	1,650	436	66	114	84	57
21	195	150	.....	.....	.....	.....	1,520	405	49	104	84	57
22	195	150	.....	.....	.....	.....	1,340	390	66	91	75	57
23	195	150	.....	.....	.....	.....	1,260	375	84	84	75	57
24	195	.....	.....	.....	.....	.....	1,120	360	104	75	75	57
25	172	.....	.....	.....	.....	.....	1,080	360	136	66	75	57
26	172	.....	.....	.....	.....	.....	1,080	360	159	66	66	57
27	172	.....	.....	.....	.....	.....	1,040	360	171	66	66	57
28	161	.....	.....	.....	.....	.....	996	345	171	66	66	66
29	150	.....	.....	.....	.....	.....	912	330	171	66	66	66
30	150	.....	.....	.....	.....	.....	870	330	171	66	66	66
31	150	.....	.....	.....	.....	.....	.....	330	.....	66	66	.....

NOTE.—Daily discharge computed from two fairly well defined rating curves. The rating curves differ slightly below gage height 3.8 feet. It is probable that the rating curve used subsequent to Nov. 23, 1912, is applicable also during the month of October, 1912. Discharge estimated, because of ice, as follows: Nov. 1–6 and 12–23, 1912, daily estimates; Apr. 1–6, 1913, 870 second-feet.

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Monthly discharge of Pembina River at Neche, N. Dak., for the year ending Sept. 30, 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
October	221	150	191	11,700	C.
November 1–23	300	150	202	9,220	D.
April	3,850	.....	1,670	99,400	B.
May	850	330	529	32,600	B.
June	330	49	191	11,400	B.
July	159	66	106	6,520	B.
August	84	66	69.5	4,270	B.
September	66	57	61.8	3,680	B.

WEST BRANCH OF ROSEAU RIVER NEAR MALUNG, MINN.

Location.—Near the center of sec. 7, T. 161 N., R. 39 W., at the highway bridge, 6¼ miles south of Roseau, 1 mile west of Malung post office, and half a mile above the mouth of the East Branch.

Records available.—May 6, 1911, to September 30, 1913.

Drainage area.—265 square miles.

Gage.—Vertical staff, read once daily to half-tenths. Limits of use: Half-tenths below and tenths above 4.5 feet. During the spring of 1913 (presumably in March), the gage had lowered 0.21 foot, probably due to the settling of the earth approach to the bridge which pushed down the plank fillers behind the abutment, the gage being attached to these fillers. The gage was not changed and has remained practically stationary subsequent to the above settlement. All gage heights subsequent to April 1, 1913, as published in the following tables, are therefore referred to a gage datum about 0.21 foot below the original datum, and 0.21 foot should be subtracted from the gage heights previous to that date in order to make them agree with the datum of the gage in its present position.

Channel and control.—Probably fairly permanent, although there is a possibility of temporary backwater from the East Branch.

Discharge measurements.—Made at the bridge except during low stages, when they are made at a wading section. Discharge measurements are also made on the East Branch a short distance above the junction and on Roseau River at Roseau for the purpose of determining the portion of the flow at Roseau that comes from the East Branch, and to estimate the entire flow below that point, as conditions of flow below the junction of the two branches are very unfavorable for the establishment of a regular station.

Winter flow.—River frozen over November to April; observations discontinued.

Regulation.—Much of the area drained by Roseau River is so swampy that it can not be cultivated without drainage. In connection with this work the river channel has been straightened and widened to 80 feet for a distance of 40 miles; a drainage system benefiting 90,000 acres of land south of the river discharges into the Roseau by 10 ditches 1 mile apart in T. 163, Rs. 43 and 44. Another ditch system, draining about 20,000 acres, enters Roseau River in sec. 6, T. 162 N., R. 39 W.

Discharge measurements of West Branch of Roseau River near Malung, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Oct. 9	W. B. Stevenson	7.22	387
Apr. 28	....do	3.91	81
Aug. 15	E. F. Chandler	2.36	a 2.5

a Measurement made by wading at a section about 600 feet below gage; velocity determined by means of floats.

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Discharge measurements of East Branch of Roseau River near Malung, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Oct. 9	W. B. Stevenson	6.43	344
Apr. 28	....do	3.38	131
Aug. 15	E. F. Chandler	1.21	a12.5

a Measurement made by wading.

Discharge measurements of Roseau River at Roseau, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Oct. 10	W. B. Stevenson	8.43	755
Apr. 29	....do	4.91	197
Aug. 16	E. F. Chandler	2.19	a14.5

a Measurement made by wading at a section above the Great Northern Railway bridge.

Daily gage height, in feet, of West Branch of Roseau River near Malung, Minn., for the year ending Sept. 30, 1913.

[August Hedin, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	11.5	4.5	.....	.....	.....	.....	.....	3.5	2.8	2.3	2.4	2.3
2	11.4	4.4	.....	.....	.....	.....	.....	3.4	2.8	2.3	2.4	2.3
3	10.8	4.3	.....	.....	.....	.....	.....	3.4	.....	2.3	2.3	2.25
4	10.1	4.0	.....	.....	.....	.....	.....	3.5	.....	2.3	2.3	2.25
5	9.2	4.0	.....	.....	.....	.....	.....	3.7	.....	2.4	2.3	2.2
6	8.2	3.9	.....	.....	.....	.....	12.8	3.8	2.8	2.4	2.2	2.2
7	7.5	3.9	.....	.....	.....	.....	12.8	3.8	2.8	2.4	2.2	2.2
8	7.3	3.9	.....	.....	.....	.....	12.6	3.75	2.95	2.5	2.2	2.2
9	7.2	4.0	.....	.....	.....	.....	11.8	3.75	2.9	2.45	2.2	2.2
10	7.0	4.2	.....	.....	.....	.....	10.9	3.85	2.85	2.4	2.2	2.4
11	6.7	4.2	.....	.....	.....	.....	10.6	3.65	2.75	2.5	2.2	2.4
12	6.6	4.1	.....	.....	.....	.....	9.6	3.6	2.7	2.5	2.2	2.35
13	6.5	4.0	.....	.....	.....	.....	8.5	3.4	2.6	3.4	2.2	2.3
14	6.4	3.9	.....	.....	.....	.....	7.7	3.35	2.6	3.9	2.2	2.3
15	6.1	3.8	.....	.....	.....	.....	7.0	3.3	2.5	3.9	2.3	2.3
16	5.8	3.6	.....	.....	.....	.....	6.2	3.3	2.5	3.9	2.4	2.3
17	5.5	3.6	.....	.....	.....	.....	5.6	3.3	2.5	3.9	2.45	2.3
18	5.2	3.6	.....	.....	.....	.....	5.0	3.3	2.45	3.8	2.5	2.25
19	5.0	3.6	.....	.....	.....	.....	4.6	3.25	2.45	3.6	2.45	2.25
20	4.8	3.4	.....	.....	.....	.....	4.3	3.2	2.4	3.4	2.45	2.25
21	4.6	3.2	.....	.....	.....	.....	4.2	3.1	2.4	3.2	2.45	2.25
22	4.4	3.3	.....	.....	.....	.....	4.15	3.1	2.4	3.0	2.45	2.25
23	4.2	3.5	.....	.....	.....	.....	4.3	3.05	2.4	2.9	2.45	2.2
24	4.0	3.2	.....	.....	.....	.....	4.3	3.0	2.4	2.8	2.45	2.2
25	3.9	3.0	.....	.....	.....	.....	4.4	3.1	2.3	2.7	2.4	2.2
26	3.8	3.0	.....	.....	.....	.....	4.3	3.1	2.3	2.6	2.4	2.2
27	3.7	2.9	.....	.....	.....	.....	4.1	3.0	2.4	2.7	2.4	2.2
28	3.6	2.9	.....	.....	.....	.....	3.9	3.0	2.4	2.6	2.4	2.2
29	3.7	2.8	.....	.....	.....	.....	3.8	2.95	2.35	2.5	2.4	2.2
30	4.0	2.7	.....	.....	.....	.....	3.65	2.9	2.3	2.5	2.35	2.2
31	4.5	.....	.....	.....	.....	.....	.....	2.85	.....	2.5	2.35	.....

NOTE.—Discharge relation affected by ice about Nov. 18, 1912, to Apr. 7, 1913.

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Daily discharge, in second-feet, of West Branch of Roseau River near Malung, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,040	115	.....	.....	.....	.....	.....	49	12	2.8	4.0	2.8
2	1,030	108	.....	.....	.....	.....	.....	43	12	2.8	4.0	2.8
3	926	101	.....	.....	.....	.....	.....	43	12	2.8	2.8	2.3
4	807	80	.....	.....	.....	.....	.....	49	12	2.8	2.8	2.3
5	660	80	.....	.....	.....	.....	.....	63	12	4.0	2.8	1.8
6	514	73	.....	.....	.....	.....	.....	70	12	4.0	1.8	1.8
7	421	73	.....	.....	.....	.....	.....	70	12	4.0	1.8	1.8
8	396	73	.....	.....	.....	.....	854	66	18	5.4	1.8	1.8
9	384	80	.....	.....	.....	.....	782	66	16	4.7	1.8	1.8
10	360	94	.....	.....	.....	.....	701	74	14	4.0	1.8	4.0
11	325	94	.....	.....	.....	.....	674	60	10	5.4	1.8	4.0
12	314	87	.....	.....	.....	.....	584	56	9.0	5.4	1.8	3.4
13	303	80	.....	.....	.....	.....	485	43	7.0	43	1.8	2.8
14	292	73	.....	.....	.....	.....	413	40	7.0	78	1.8	2.8
15	260	67	.....	.....	.....	.....	350	37	5.4	78	2.8	2.8
16	230	55	.....	.....	.....	.....	278	37	5.4	78	4.0	2.8
17	200	55	.....	.....	.....	.....	224	37	5.4	78	4.7	2.8
18	173	.....	.....	.....	.....	.....	170	37	4.7	70	5.4	2.3
19	155	.....	.....	.....	.....	.....	134	34	4.7	56	4.7	2.3
20	138	.....	.....	.....	.....	.....	110	31	4.0	43	4.7	2.3
21	122	.....	.....	.....	.....	.....	102	26	4.0	31	4.7	2.3
22	108	.....	.....	.....	.....	.....	98	26	4.0	21	4.7	2.3
23	94	.....	.....	.....	.....	.....	110	24	4.0	16	4.7	1.8
24	80	.....	.....	.....	.....	.....	110	21	4.0	12	4.7	1.8
25	73	.....	.....	.....	.....	.....	118	26	2.8	9.0	4.0	1.8
26	67	.....	.....	.....	.....	.....	110	26	2.8	7.0	4.0	1.8
27	61	.....	.....	.....	.....	.....	94	21	4.0	9.0	4.0	1.8
28	55	.....	.....	.....	.....	.....	78	21	4.0	7.0	4.0	1.8
29	61	.....	.....	.....	.....	.....	70	18	3.4	5.4	4.0	1.8
30	80	.....	.....	.....	.....	.....	60	16	2.8	5.4	3.4	1.8
31	115	.....	.....	.....	.....	.....	.....	14	.....	5.4	3.4	.....

NOTE.—Daily discharge computed from a rating curve fairly well defined between 49 and 440 second-feet (gage heights, 3.5 and 8.0 feet) and poorly defined beyond these stages. Discharge estimated, because of ice, from gage heights, observer's notes, climatic records, and discharge of adjacent drainage areas, as follows: Nov. 18–30, 27 second-feet, and Dec. 1–31, 1912, 10 second-feet. Discharge estimated, because of ice by Prof. E. F. Chandler, from climatic records, discharge of adjacent drainage areas, and observer's notes concerning any marked variation in discharge, as follows: Jan. 1–31, 3 second-feet; Feb. 1–28, 1 second-foot; Mar. 1–31, 2 second-feet; and Apr. 1–7, 340 second-feet. It should be noted that these estimates are based on less data than estimates at most stations in this report and that they simply represent the best values available for publication.

Monthly discharge of West Branch of Roseau River near Malung, Minn., for the year ending Sept. 30, 1913.

Month.	Discharge in second-feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
October	1,040	55	318	C.
November	115	.....	58.0	C.
December	.....	.....	10	
January	.....	.....	3	
February	.....	.....	1	
March	.....	.....	2	
April	.....	.....	303	C.
May	74	14	40.1	B.
June	18	2.8	7.68	C.
July	78	2.8	22.6	C.
August	5.4	1.8	3.37	D.
September	4.0	1.8	2.35	D.
The year	.....	.....	64.4	

NOTE.—See footnote to table of daily discharge.

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MOUSE RIVER AT MINOT, N. DAK.

Location.—At the Anne Street foot bridge northeast of the Great Northern Railway roundhouse at Minot, N. Dak.

Records available.—May 5, 1903, to September 30, 1913.

Drainage area.—8,400 square miles.

Gage.—Vertical staff attached to pier of the Anne Street Bridge. The original gage, superseded in 1910 by this gage, was at a bridge about 40 rods farther upstream. At low stage, because the water is ponded by a dam below, there is no appreciable slope in the water surface and the gage zeros at the old and present sites have the same elevation; at high stage there is a slight slope in the water surface; hence, at highest stage the present gage would read slightly less than the original gage would have done, but the difference is probably less than 0.1 foot, even at extreme high water.

Channel and control.—Clay and silt; slightly shifting.

Discharge measurements.—Made from the Anne Street Bridge at medium and high stages. At low stage made by wading some rods below the dam at the Minneapolis, St. Paul & Sault Ste. Marie Railway water tank.

Winter flow.—Discharge relation somewhat affected by ice from about the middle of November to the middle of April. In most winters the discharge is very small, as has been found by occasional discharge measurements. Thus, from a few gage readings each winter approximate estimates of flow may be made.

Regulation.—A dam 4 feet high at the Minneapolis, St. Paul & Sault Ste. Marie Railway water tank, 1 mile below the gage (along the channel), raises the water at the gage about 3 feet at ordinary low stage. The dam has no sluices, being designed merely to give enough depth of water for the intake-pipe suction; but it is not absolutely tight. When the discharge is less than about 6 second-feet the water level falls below the crest of the dam. The crest of the dam is nearly level and can be considered as a broad-crested weir until (at gage reading about 6 feet) corrections for submergence of the weir by the filling of the channel below the weir need be applied. During the flood in April, 1913, a section of the crest of the dam was washed out. A short time later the dam was repaired and the crest was raised slightly.

Accuracy.—The percentage errors of the results for the low-water period may be largely due to small errors made by the gage observer and the undetermined leakage through the dam, although the error is but a few second-feet. At medium stages the results are good.

Discharge measurements of Mouse River at Minot, N. Dak., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 14	W. B. Stevenson	8.67	943
15	....do	8.59	928
Sept. 12	E. F. Chandler	4.68	9.4

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Daily gage height, in feet, of Mouse River at Minot, N. Dak., for the year ending Sept. 30, 1913.

[Ephraim Cox, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4.55	4.8	.....	.....	.....	.....	10.8	5.9	5.2	4.9	5.35	5.15
2	4.5	4.8	.....	.....	.....	.....	11.2	5.85	5.15	4.85	5.3	5.1
3	4.5	4.75	.....	.....	.....	.....	11.0	5.8	5.15	4.85	5.3	5.1
4	4.5	4.75	.....	.....	.....	.....	10.5	5.7	5.1	4.8	5.3	5.0
5	1.5	4.7	.....	.....	.....	.....	9.0	5.65	5.1	4.85	5.25	5.0
6	4.5	4.7	.....	.....	.....	.....	8.8	5.6	5.0	4.85	5.25	5.0
7	4.5	4.7	.....	.....	.....	.....	8.9	5.55	5.0	4.85	5.25	5.0
8	4.5	4.7	.....	.....	.....	.....	9.4	5.5	4.95	4.85	5.2	4.95
9	4.55	4.7	.....	.....	.....	4.6	9.5	5.45	4.95	4.8	5.2	4.9
10	4.6	4.7	.....	.....	.....	4.75	9.3	5.45	4.95	4.8	5.2	4.8
11	4.65	4.7	.....	.....	.....	5.1	9.0	5.4	4.95	4.85	5.25	4.7
12	4.7	4.7	.....	.....	.....	5.6	8.8	5.4	5.0	4.85	5.25	4.65
13	4.75	4.65	.....	.....	.....	5.9	8.6	5.35	5.0	4.9	5.25	4.6
14	4.75	4.65	.....	.....	.....	5.95	8.6	5.35	5.0	4.95	5.25	4.55
15	4.8	4.65	.....	3.7	2.0	5.85	8.6	5.35	5.05	5.0	5.2	4.55
16	4.8	4.65	.....	.....	.....	5.8	8.6	5.3	5.05	5.0	5.15	4.5
17	4.75	4.65	.....	.....	.....	5.75	8.6	5.3	5.1	5.05	5.1	4.5
18	4.75	4.65	.....	.....	.....	5.7	8.4	5.35	5.1	5.1	5.1	4.45
19	4.75	4.65	.....	.....	.....	5.4	8.0	5.4	5.1	5.2	5.15	4.45
20	4.75	4.65	.....	.....	.....	5.25	7.8	5.4	5.05	5.3	5.15	4.4
21	4.75	4.6	.....	.....	.....	5.1	7.5	5.35	5.0	5.45	5.15	4.4
22	4.75	4.6	.....	.....	.....	4.95	7.2	5.35	5.0	5.55	5.1	4.4
23	4.7	4.6	.....	.....	.....	4.90	7.0	5.35	5.0	5.55	5.1	4.4
24	4.7	4.6	.....	.....	.....	4.85	7.0	5.3	4.95	5.5	5.1	4.45
25	4.7	4.6	.....	.....	.....	4.80	6.8	5.3	4.95	5.45	5.1	4.5
26	4.7	4.6	.....	.....	.....	4.75	6.6	5.3	4.95	5.4	5.1	4.5
27	4.7	4.6	.....	.....	.....	4.7	6.2	5.3	4.9	5.3	5.1	4.45
28	4.75	4.6	.....	.....	1.8	4.7	6.0	5.25	4.9	5.3	5.1	4.45
29	4.75	4.6	.....	.....	.....	4.7	5.95	5.25	4.9	5.35	5.15	4.4
30	4.75	4.6	.....	.....	.....	6.9	5.9	5.2	4.85	5.4	5.15	4.4
31	4.8	.....	.....	3.0	.....	8.9	.....	5.2	.....	5.4	5.15	.....

NOTE.—Discharge relation affected by ice about Nov. 14, 1912, to Apr. 5, 1913.

Daily discharge, in second-feet, of Mouse River at Minot, N. Dak., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	30	69	.....	.....	.....	.....	966	266	90	29	125	79
2	24	69	.....	.....	.....	.....	1,030	252	79	23	113	68
3	24	60	.....	.....	.....	.....	1,070	239	79	23	113	68
4	24	60	.....	.....	.....	.....	1,080	213	68	17	113	47
5	24	52	.....	.....	.....	.....	910	200	68	23	101	47
6	24	52	.....	.....	.....	.....	966	187	47	23	101	47
7	24	52	.....	.....	.....	.....	984	174	47	23	101	47
8	24	52	.....	.....	.....	.....	1,060	162	38	23	90	38
9	30	52	.....	.....	.....	.....	1,080	149	38	17	90	29
10	36	52	.....	.....	.....	.....	1,050	149	38	17	90	17
11	44	52	.....	.....	.....	.....	1,000	137	38	23	101	10
12	52	52	.....	.....	.....	.....	966	137	47	23	101	8.3
13	60	44	.....	.....	.....	.....	929	125	47	29	101	7.5
14	60	36	.....	.....	.....	.....	929	125	47	38	101	7.0
15	69	36	.....	.....	.....	.....	929	125	57	47	90	7.0
16	69	36	.....	.....	.....	.....	929	113	57	47	79	6.5
17	60	36	.....	.....	.....	.....	929	113	68	57	68	6.5
18	60	36	.....	.....	.....	.....	890	125	68	68	68	6.1
19	60	36	.....	.....	.....	.....	806	137	68	90	79	6.1
20	60	36	.....	.....	.....	.....	761	137	57	113	79	5.6
21	60	30	.....	.....	.....	.....	690	125	47	149	79	5.6
22	60	30	.....	.....	.....	.....	614	125	47	174	68	5.6
23	52	30	.....	.....	.....	.....	562	125	47	174	68	5.6
24	52	30	.....	.....	.....	.....	562	113	38	162	68	6.1
25	52	30	.....	.....	.....	.....	509	113	38	149	68	6.5
26	52	30	.....	.....	.....	.....	455	113	38	137	68	6.5
27	52	30	.....	.....	.....	.....	347	113	29	113	68	6.1
28	60	30	.....	.....	.....	.....	293	101	29	113	68	6.1
29	60	30	.....	.....	.....	.....	279	101	29	125	79	5.6
30	60	30	.....	.....	.....	.....	266	90	23	137	79	5.6
31	69	.....	.....	.....	.....	.....	.....	90	.....	137	79	.....

NOTE.—Daily discharge computed from two rating curves fairly well defined for medium and high stages. Discharge estimated, because of ice, from observer's notes and climatic records, as follows: Nov. 14–30, 1912, and Apr. 1–5, 1913, daily values; Mar. 1–31, 1913, 59 second-feet.

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Monthly discharge of Mouse River at Minot, N. Dak., for the year ending Sept. 30, 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
October	69	24	48.0	2,950	C.
November	69	30	42.3	2,520	C.
March			59	3,620	
April	1,080	266	795	47,300	B.
May	266	90	144	8,880	B.
June	90	23	30.4	1,800	B.
July	174	17	74.9	4,610	B.
August	125	68	87.3	5,370	B.
September	79	5.6	20.6	1,220	B.

EVAPORATION AT UNIVERSITY, N. DAK.[1]

The evaporation gage at University, N. Dak., was established April 17, 1905, on a pool in a ravine called English Coulee, which runs through the campus of the University of North Dakota, which is immediately west of Grand Forks, N. Dak., and 2 miles west of the Minnesota boundary.

The records at this station were continued during the year ending September 30, 1913, daily observations being made during the entire open season, except the first 10 days. The gage was protected from disturbance, and the records of observations are reliable.

The coulee drains about 60 square miles of very level prairie. Except for brief freshets the flow in the coulee is small, varying from 1 second-foot or less to 20 second-feet. In very dry weather the water lies in pools with scarcely any perceptible flow.

A heavy galvanized-iron tank, 3 feet square and 18 inches deep, is placed in the center of an anchored raft, so that the water in the tank is at the same level as the water surface outside. The tank is filled nearly to the top, to a height precisely marked by the pointed tip of a vertical rod in the center of the tank. Once each day, after the change produced by evaporation or rainfall, the water level is restored to the original height, the precise amount of water transferred being measured with a cup of such size that one cupful of water is equaivalent to 0.01 inch depth in the tank.

A standard rain gage is located on the open prairie about 10 rods distant. On days of rainfall the difference (which is usually small) between the quantity measured by the rain gage and the surplus in the tank is considered the total evaporation for the day.

Observations were made usually about half an hour before sunset. The temperature of the water recorded is the observation of the water in the tank; as the tank is a metal tank, it has been found that at that time of the day there is rarely a perceptible difference in temperature reading between the water within and without the tank. The temperature of the air as recorded is the mean of the readings of the standard self-recording maximum and the self-recording minimum thermometers for the preceding 24 hours.

The following table shows for each 10-day period during the year ending September 30, 1913, the gross evaporation, the total rainfall, and the mean temperatures for the 10 observations of the water and of the air.

[1] For complete description of this station and records of evaporation, rainfall, and temperature for 1905 to 1908, see U. S. Geol. Survey Water-Supply Paper 245, pp. 64-67, 1910.

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Evaporation, rainfall, and temperature at University, N. Dak., for the year ending Sept. 30, 1913.

[T. T. Quirke and J. B. Johnson, observers.]

Date.	Evaporation.	Rainfall.	Mean temperature.		Date.	Evaporation.	Rainfall.	Mean temperature.	
			Water.	Air.				Water.	Air.
	Inches.	*Inches.*	*°F.*	*°F.*		*Inches.*	*Inches.*	*°F.*	*°F.*
Oct. 1–10	0.57	0.26	47	3,250	May 11–20	1.36	0.27	52	48
11–20	.61	.00	42	48	21–31	1.72	.75	61	61
21–31	.48	.03	37	40	June 1–10	2.45	.16	65	58
Nov. 1–9	.15	.05	32	33	11–20	2.30	.63	69	69
10–30					21–30	2.34	.42		73
Dec. 1–31					July 1–10	2.06	.79	72	65
Jan. 1–31					11–20	1.47	1.30	71	66
Feb. 1–28					21–31	2.21	.77	71	66
Mar. 1–31					Aug. 1–10	1.75	.27	71	68
Apr. 1–4					11–20	1.55	1.35	73	74
5–10	.46	.30	37	38	21–31	1.99	.07	66	67
11–20	1.65	.00	53	52	Sept. 1–10	1.23	2.55	69	68
21–30	1.76	.23	54	51	11–20	1.68	.00	61	58
May 1–10	1.15	.50	48	43	21–30	.78	.10	47	48

RAINY LAKE AT RANIER, MINN.

Location.—At the foot of Rainy Lake, at the foot of the Ranier wharf.

Records available.—January 1, 1910, to September 30, 1913.

Gage.—Vertical staff. Prior to August 19, 1911, the gage heights were taken at the upper gage of the Minnesota & Ontario Power Co., just above the dam at International Falls, 2 miles below Ranier. Comparative readings taken on the two gages during 1911 indicated a slope of 0.50 feet between the two points, and to make the records at the two points comparable the readings on the Minnesota and Ontario gage were reduced by 488.50 feet. Recent studies by A. F. Meyer, an engineer of the International Joint Commission, indicate that the actual slope between the two gages varied from 0.3 to 1.2 feet during the period January 1, 1910, to August 18, 1911, so that the readings on the Minnesota & Ontario Power Co.'s gage should have been reduced by an amount ranging from 488.70 to 487.80 feet instead of 488.50 feet. Gage heights from January 1, 1910, to August 18, 1911, published in Water Supply Papers 285 and 305 are therefore in error, as referred to the correct datum, by an unknown amount varying from 0.2 to −0.7 foot. The dam at International Falls controls the level of Ranier Lake, which has an area of approximately 344 square miles. Owing to the great number of small islands in the lake its effective capacity is somewhat uncertain, as available maps are too small to show this accurately. Beginning August 19, 1911, the gage heights refer to the gage established by the Canadian Department of Public Works. The gage heights have been referred to the original datum of the gage, the elevation of which is 489.00 feet above that of the Minnesota & Ontario Power Co.'s gage. The gage was maintained at the following elevations during year ending September 30, 1913: October 1, 1912, to October 9, 1912, 488.77 feet; October 15, 1912, to September 30, 1913, 489.25 feet. The records at this station, by indicating the change of water level, show the gain or loss in storage due to the control at International Falls dam, and when used in connection with the records of flow of the Rainy River at International Falls, are of value in determining the natural run-off.

Cooperation.—Gages owned and maintained by the Canadian Department of Public Works.

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Daily gage height, in feet, of Rainy Lake at Ranier, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	7.28	7.03	6.45	5.81	4.98	4.00	2.93	3.15	5.45	8.04	8.35	8.38
2	7.26	7.02	6.45	5.78	4.95	3.97	2.89	3.19	5.57	8.19	8.35	8.34
3	7.26	7.01	6.45	5.75	4.91	3.95	2.87	3.23	5.73	8.13	8.39	8.34
4	7.27	7.00	6.41	5.72	4.88	3.92	2.84	3.26	5.83	8.18	8.37	8.34
5	7.27	6.98	6.37	5.70	4.84	3.87	2.80	3.31	5.99	8.21	8.39	8.29
6	7.25	6.98	6.35	5.69	4.80	3.81	2.77	3.37	6.13	8.32	8.40	8.32
7	7.25	6.96	6.33	5.67	4.77	3.75	2.75	3.39	6.25	8.35	8.35	8.34
8	7.26	6.86	6.31	5.65	4.73	3.70	2.71	3.43	6.40	8.35	8.35	8.33
9	7.27	6.92	6.28	5.63	4.69	3.67	2.68	3.47	6.52	8.37	8.43	8.32
10	.....	6.90	6.25	5.61	4.66	3.65	2.65	3.51	6.65	8.37	8.45	8.29
11	.....	6.90	6.22	5.59	4.62	3.63	2.65	3.56	6.77	8.35	8.35	8.32
12	.....	6.89	6.19	5.59	4.59	3.59	2.64	3.62	6.89	8.45	8.30	8.32
13	.....	6.87	6.16	5.57	4.56	3.56	2.65	3.66	7.03	8.45	8.30	8.27
14	.....	6.84	6.12	5.53	4.52	3.53	2.68	3.70	7.11	8.47	8.30	8.24
15	7.25	6.81	6.10	5.46	4.49	3.49	2.69	3.76	7.20	8.43	8.42	8.21
16	7.23	6.77	6.09	5.43	4.45	3.45	2.71	3.83	7.29	8.45	8.35	8.21
17	7.25	6.75	6.07	5.41	4.42	3.41	2.75	3.91	7.37	8.43	8.40	8.19
18	7.19	6.73	6.05	5.39	4.37	3.38	2.79	3.99	7.47	8.41	8.37	8.15
19	7.20	6.73	6.03	5.38	4.33	3.35	2.81	4.05	7.56	8.40	8.34	8.14
20	7.23	6.71	6.01	5.36	4.27	3.32	2.83	4.11	7.63	8.39	8.33	8.15
21	7.17	6.65	5.99	5.31	4.23	3.29	2.85	4.21	7.69	8.37	8.27	8.12
22	7.16	6.65	5.98	5.27	4.19	3.27	2.87	4.33	7.73	8.40	8.29	8.11
23	7.15	6.65	5.97	5.23	4.18	3.25	2.89	4.42	7.78	.....	8.26	8.09
24	7.11	6.61	5.95	5.19	4.15	3.21	2.94	4.52	7.85	8.37	8.33	8.09
25	7.10	6.59	5.93	5.17	4.13	3.17	2.97	4.61	7.91	8.35	8.28	8.05
26	7.09	6.55	5.91	5.15	4.09	3.14	3.00	4.69	7.96	8.35	8.26	8.04
27	7.08	6.53	5.89	5.13	4.07	3.10	3.05	4.77	8.04	.....	8.29	7.99
28	7.07	6.49	5.87	5.09	4.04	3.06	3.10	4.87	8.06	8.31	8.23	8.00
29	7.05	6.41	5.85	5.07	.....	3.03	3.11	4.97	8.05	8.29	8.28	8.00
30	7.06	6.44	5.85	5.05	.....	2.99	3.13	5.11	8.07	8.26	8.31	7.98
31	7.05	.....	5.83	5.02	.....	2.95	.....	5.22	.....	8.29	8.45	.....

NOTE.—Gage heights here published refer to datum 489.00. Gage readings Oct. 1-9, 1912, have been corrected by subtracting 0.23 foot, and Oct. 15, 1912, to Sept. 30, 1913, by adding 0.25 foot.

RAINY RIVER AT INTERNATIONAL FALLS, MINN.

Location.—At the steamboat dock half a mile below the dam at International Falls.

Records available.—March 1, 1907, to September 30, 1913.

Drainage area.—14,600 square miles.

Gage.—Vertical staff installed by the United States Geological Survey April 20, 1911. Prior to this date the gage heights, furnished through the courtesy of the Minnesota & Ontario Power Co., were read on a gage just below the dam, first on the American side but later on the Canadian side. The zero of the United States Geological Survey gage is 460.99 feet above that of the power company's gage, when the slope of the river between the two points (determined at gage height 2.65 feet) is considered. On September 15, 1913, an automatic gage was installed by the Canadian Department of Public Works near the staff gage and at the same datum.

Channel and control.—Practically permanent.

Discharge measurements.—Made from a boat at a section about 100 feet below the gage where the bed of the river is uniform and the velocity is regular.

Winter flow.—Ice rarely forms in the long stretch of water below the dam. It does form, however, at the rapids below the open stretch causing serious backwater at the gage amounting at times to more than 2 feet. Estimates of winter flow are based directly on the records of flow through the turbines of the power company, as computed by the Canadian Department of Public Works.

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Regulation.—Since the dam and power house have been in operation practically no water has passed over the crest, the entire flow of the Rainy going through the turbines and sluice gates. The plant is run on a 24-hour basis, however, so that with the exception of the Sunday flow the discharge is fairly uniform.

Accuracy.—Studies of the previous records at this station, based on more complete data than were available when Water-Supply Paper 305 was prepared, indicate that the estimates of monthly discharge published in that report are in error. The estimated errors were published in Water-Supply Paper 325, page 61. The estimated error for December, 1908, as given in that table should be +14 per cent instead of −14 per cent. Throughout the greater part of the open-water period during the year ending September 30, 1913, the discharge relation was affected by backwater from log booms below the gage.

Cooperation.—Estimates of flow through the power house and results of discharge measurements furnished by Canadian Department of Public Works. Discharge measurements were also furnished by the water power branch of the Canadian Department of the Interior.

Discharge measurements of Rainy River at International Falls, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 2	A. Pierce [a]	2.23	[b] 5,160	Apr. 2	Brown & Jamison [a]	3.21	[b] 6,020
Nov. 6	R. H. Nelson [a]	2.88	[b] 6,420	May 22	D. W. Jamison [a]	4.55	[b] 7,080
Jan. 12	A. Pierce [a]	3.43	[b] 4,850	June 13	(a)	4.14	[b] 8,180
Feb. 20	G. M. Brown [a]	4.77	[b] 6,940	July 23	D. W. Jamison [a]	7.33	[b] 12,800
Mar. 8	....do	4.87	[b] 6,670	Aug. 28	(a)	3.02	7,850
20	....do	4.59	[b] 6,730	Sept. 23	(a)	2.78	7,300

[a] Canadian engineers. [b] Discharge relation affected by backwater.

Daily gage height, in feet, of Rainy River at International Falls, Minn., for the year ending Sept. 30, 1913.

[Robert Caple, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3.4	2.8	2.8	3.9	4.8	4.8	3.5	4.5	3.8	6.1	5.2	1.7
2	3.3	2.8	3.6	3.9	3.8	4.1	3.2	4.3	3.8	6.2	5.2	2.7
3	3.2	2.2	4.0	4.0	3.7	4.0	3.0	4.2	4.3	6.4	4.9	2.8
4	3.1	2.1	4.0	4.2	4.6	4.9	3.2	3.9	4.2	6.0	4.7	2.9
5	3.2	2.9	4.0	3.2	4.8	4.9	3.1	4.4	4.0	5.6	4.4	2.9
6	2.7	2.9	4.0	3.2	4.8	5.0	2.4	4.7	4.2	6.2	4.4	2.9
7	2.8	2.9	3.8	4.1	4.8	5.0	2.1	4.8	4.4	6.3	4.7	2.8
8	2.9	2.9	3.4	4.2	4.7	4.9	2.8	4.7	4.6	6.2	4.9	3.0
9	3.0	2.8	3.4	4.2	4.2	4.6	3.1	4.5	4.9	6.3	4.9	3.0
10	3.0	2.2	4.3	4.3	4.1	3.9	3.0	4.2	4.9	6.8	4.2	3.0
11	3.0	2.2	4.4	4.5	4.8	4.4	3.1	3.6	4.6	7.0	4.3	3.0
12	3.1	2.6	4.5	3.7	4.8	4.3	3.2	3.6	4.3	7.2	4.6	3.1
13	2.5	2.8	4.5	3.6	4.9	4.2	2.7	3.7	4.1	7.3	4.6	3.1
14	2.8	2.8	4.4	4.3	4.9	4.1	2.8	3.6	4.0	7.6	4.5	2.6
15	2.9	2.8	3.6	4.4	4.9	4.6	4.1	3.6	3.7	7.8	4.5	2.6
16	2.9	2.7	3.4	4.4	4.2	3.5	4.8	3.7	3.9	7.7	4.5	3.0
17	2.8	2.2	4.2	4.4	3.9	3.6	4.9	4.1	3.9	8.2	4.2	3.0
18	2.8	2.4	4.3	4.5	4.7	4.2	5.0	4.4	3.9	8.4	4.3	2.9
19	2.9	2.8	4.4	3.6	4.8	4.5	5.0	4.6	3.8	8.4	4.5	2.9
20	2.5	2.8	4.4	3.6	4.8	4.7	4.4	4.7	4.0	7.9	4.6	2.9
21	2.2	3.0	4.2	4.4	4.8	4.6	4.3	4.5	4.3	7.6	4.6	2.7
22	2.7	2.9	3.3	4.6	4.8	4.6	4.4	4.4	4.4	7.5	4.6	2.7
23	2.8	2.8	3.2	4.6	4.4	3.8	4.3	4.5	4.4	7.3	4.6	2.7
24	2.8	2.3	3.4	4.7	4.1	3.6	4.3	4.6	4.5	7.3	4.1	2.6
25	2.8	2.3	3.0	4.6	4.8	4.3	4.5	4.2	4.6	7.2	3.6	2.6
26	2.8	2.7	2.8	4.0	5.0	4.4	4.9	4.0	4.6	7.0	3.2	2.6
27	2.1	2.8	3.5	3.6	5.0	4.4	4.7	4.1	4.6	6.7	3.0	2.5
28	2.1	2.8	3.2	4.5	4.9	4.3	4.9	3.9	4.9	6.7	3.0	2.4
29	2.7	2.8	3.2	4.7	.....	4.2	5.0	3.7	5.7	6.8	2.9	2.5
30	2.8	2.7	3.1	4.6	.....	3.2	4.8	3.7	6.0	6.2	2.8	2.5
31	2.8	.....	3.8	4.8	.....	2.9	.....	4.1	.....	5.7	1.7	.....

NOTE.—Discharge relation affected by backwater from about Dec. 1 to the latter part of August. See "Accuracy" in station description.

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Daily discharge, in second-feet, of Rainy River at International Falls, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	7,279	7,087	5,801	6,805	6,841	6,850	5,856	6,826	5,535	11,023	9,490	5,251
2	7,202	7,122	6,433	6,795	5,647	5,602	6,246	6,831	6,216	11,058	8,828	6,328
3	7,039	6,184	6,725	6,827	6,385	5,675	5,870	6,814	6,980	11,004	9,223	6,935
4	7,089	6,095	7,001	6,978	6,864	6,749	6,187	5,978	6,752	11,606	9,048	7,019
5	7,078	7,199	6,968	5,980	6,887	6,751	6,634	6,331	6,868	11,438	9,134	6,703
6	6,199	7,146	6,655	5,216	6,895	6,900	5,406	6,827	6,904	11,503	9,139	6,897
7	6,543	7,100	6,149	6,858	6,853	6,905	5,438	6,827	6,820	10,343	9,576	5,885
8	7,060	7,073	5,828	6,796	6,900	6,919	6,621	6,814	6,273	10,106	10,414	7,262
9	7,060	6,791	5,860	6,892	5,738	5,840	6,801	6,881	6,343	9,663	10,022	6,821
10	7,039	6,175	6,913	6,920	5,849	5,725	6,865	6,820	6,795	10,817	9,513	7,006
11	7,045	5,998	6,973	6,921	6,879	6,750	6,792	5,938	6,870	13,475	8,658	7,014
12	7,100	6,568	6,972	5,778	6,884	6,780	6,783	6,172	6,911	13,510	9,108	6,964
13	[a]6,880	6,923	6,962	6,124	6,878	6,716	5,883	6,761	6,902	12,836	9,076	7,010
14	6,664	7,020	6,675	6,911	6,872	6,798	5,419	6,788	7,052	13,539	9,207	6,223
15	7,083	6,955	5,412	6,932	6,853	6,739	6,715	6,730	6,729	14,483	9,264	6,455
16	7,044	7,041	5,532	6,941	5,618	5,464	6,837	6,765	6,398	14,332	8,968	6,960
17	7,047	5,261	7,267	6,909	5,477	5,653	6,801	6,820	7,508	14,570	8,758	7,094
18	6,852	6,511	6,987	6,947	6,865	6,730	6,716	5,994	7,410	14,243	8,651	7,000
19	6,987	6,999	6,850	6,015	6,877	6,747	6,751	6,163	7,336	15,290	9,050	6,985
20	6,594	7,015	6,989	5,073	6,853	6,682	5,324	6,772	7,473	14,706	8,943	6,975
21	5,824	7,089	6,762	6,956	6,894	6,752	6,254	6,796	7,468	12,187	8,936	6,535
22	7,076	7,033	5,900	6,945	6,844	6,715	6,368	6,777	6,689	13,221	9,118	6,909
23	7,111	7,050	4,650	6,909	5,631	5,598	6,706	6,760	7,324	13,254	8,888	7,060
24	7,070	6,174	6,581	6,937	6,054	4,921	6,758	6,785	7,814	13,331	6,232	7,046
25	7,056	5,978	5,011	6,955	6,864	6,840	6,726	6,162	7,840	13,260	7,229	7,215
26	7,078	7,002	4,591	5,896	6,847	6,813	6,746	6,088	7,856	13,262	7,022	6,994
27	6,135	7,054	5,995	6,273	6,830	6,811	5,873	6,749	8,798	12,802	6,965	6,915
28	5,927	7,047	6,549	6,856	6,830	6,775	6,180	6,550	8,832	12,844	7,005	6,021
29	6,968	6,687	5,762	6,928	.....	6,800	6,696	6,889	9,673	13,292	6,767	6,600
30	7,076	6,422	5,137	6,977	.....	5,946	6,913	6,896	9,863	13,727	6,765	7,080
31	7,112	.....	6,751	6,981	.....	5,990	.....	6,906	.....	9,794	5,660	.....

[a] Interpolated by engineers of United States Geological Survey.

NOTE. Daily discharge record furnished by S. B. Johnson, hydraulic engineer, department of public works, Canada, and were computed from power-house records.

Monthly discharge of Rainy River at International Falls, Minn., for the year ending Sept. 30, 1913.

[Drainage area, 14,600 square miles.[a]]

Month.	Discharge in second-feet.		
	Maximum.	Minimum.	Mean.
October	7,280	5,820	6,880
November	7,200	5,260	6,730
December	7,270	4,590	6,280
January	6,980	5,070	6,620
February	6,900	5,480	6,560
March	6,920	4,920	6,420
April	6,910	5,320	6,370
May	6,910	5,940	6,620
June	9,860	5,540	7,270
July	15,300	9,660	12,600
August	10,400	5,660	8,540
September	7,260	5,250	6,770
The year	15,300	4,590	7,320

[a] "Discharge in second-feet per square mile" and "Run-off (depth in inches)" are not published for this drainage area, because such values are believed not to represent the natural flow at this station. See "Regulation" in station description.

NOTE.—Discharge computed to 3 significant figures by engineers of the United States Geological Survey from the daily discharge record furnished by S. B. Johnson, hydraulic engineer, Department of Public Works, Canada.

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VERMILION RIVER BELOW LAKE VERMILION, NEAR TOWER, MINN.

Location.—In sec. 2, T. 63 N., R. 17 W., just below the dam at outlet of Lake Vermilion, in St. Louis County, 4 miles above the mouth of Twomile Creek, which enters from the west.

Records available.—May 17, 1911, to September 30, 1913.

Drainage area.—507 square miles.

Gage.—Vertical staff. From October to April, read once daily to half-tenths; from May to September, read morning and evening to half-tenths. Limits of use: Hundredths below 1.0, half-tenths from 1.0 to 2.5, and tenths above 2.5 feet.

Channel and control.—There are steep rapids just below the gage. As the bed of the stream is composed of solid rock and large bowlders, the control is permanent.

Discharge measurements.—Made from cable just below the gage.

Winter flow.—Owing to the heavy fall at the gage section, amounting to 20 feet in 200 yards, there is little or no backwater from ice during the winter months.

Regulation.—At the outlet of Vermilion Lake, a few hundred feet above the gage, there is a dam which is used to raise the elevation of the lake for aid in navigation. There are no gates in the dam, but on July 19, 1912, it was repaired. For a period after this date the flow was lower than normal as there was less leakage. The lake has a slightly larger storage at the present time so that the flow during the winter period of 1912–13 was somewhat larger than it would have been had not the dam been repaired.

Accuracy.—Conditions are favorable for fairly accurate results, the only uncertainty being some inaccuracy in the discharge measurements owing to the very rocky section.

Discharge measurements of Vermilion River below Lake Vermilion, near Tower, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Oct. 16	S. B. Soulé	0.58	105
July 2	....do	2.63	908
2	....do	2.62	912

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Daily gage height, in feet, of Vermilion River below Lake Vermilion, near Tower, Minn., for the year ending Sept. 30, 1913.

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	0.6	0.5	0.5	0.5	0.5	0.5	0.52	.....	3.3	2.8	1.85	0.33
2	.6	.5	.5	.5	.5	.5	.52	.....	3.3	2.7	1.95	.33
3	.6	.5	.5	.5	.5	.5	.52	.....	3.4	2.6	1.85	.33
4	.6	.5	.5	.5	.5	.5	.52	.....	3.4	2.6	1.9	.33
5	.6	.5	.5	.5	.5	.5	.52	1.2	3.4	2.5	1.8	.33
6	.6	.5	.5	.5	.5	.5	.52	1.3	3.5	2.5	1.65	.33
7	.6	.5	.5	.5	.5	.5	.52	1.3	3.5	2.35	1.25	.33
8	.6	.5	.5	.5	.5	.5	.52	1.4	3.5	2.4	1.2	.33
9	.6	.5	.5	.5	.5	.5	.52	1.4	3.5	2.35	1.1	.33
10	.6	.5	.5	.5	.5	.5	.52	1.4	3.5	2.3	.85	.33
11	.6	.5	.5	.5	.5	.5	.52	1.4	3.5	2.4	.65	.33
12	.6	.5	.5	.5	.5	.5	.52	1.4	3.4	2.35	.6	.33
13	.6	.5	.5	.5	.5	.5	.55	1.4	3.4	2.2	.55	.33
14	.6	.5	.5	.5	.5	.5	.55	1.4	3.4	2.25	.53	.33
15	.6	.5	.5	.5	.5	.5	.55	1.5	3.4	2.2	.5	.33
16	.6	.5	.5	.5	.5	.5	.....	1.6	3.4	2.25	.5	.33
17	.6	.5	.5	.5	.5	.5	.....	1.7	3.3	2.2	.5	.33
18	.6	.5	.5	.5	.5	.5	.....	1.8	3.2	2.3	.5	.33
19	.6	.5	.5	.5	.5	.5	.....	1.8	3.2	2.25	.5	.28
20	.55	.5	.5	.5	.5	.5	.....	2.0	3.2	2.2	.45	.28
21	.55	.5	.5	.5	.5	.5	.....	2.0	3.1	2.1	.45	.28
22	.55	.5	.5	.5	.5	.5	.....	2.5	3.0	2.2	.4	.25
23	.55	.5	.5	.5	.5	.5	.....	3.0	3.0	2.05	.4	.23
24	.55	.5	.5	.5	.5	.5	.....	3.1	3.0	2.2	.4	.23
25	.55	.5	.5	.5	.5	.5	.....	3.2	2.9	2.15	.35	.23
26	.55	.5	.5	.5	.5	.5	.....	3.2	2.9	2.15	.35	.23
27	.55	.5	.5	.5	.5	.5	.....	3.2	2.8	2.0	.35	.23
28	.55	.5	.5	.5	.5	.5	.....	3.2	2.8	2.1	.35	.23
29	.55	.5	.5	.5	.....	.5	.....	3.3	2.8	1.95	.35	.23
30	.55	.5	.5	.5	.....	.5	.....	3.3	2.7	1.8	.35	.23
31	.55	.....	.5	.5	.....	.5	.....	3.3	.....	1.9	.35	.....

NOTE.—Discharge relation probably not materially affected by ice during the year ending Sept. 30, 1913.

Daily discharge, in second-feet, of Vermilion River below Lake Vermilion, near Tower, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	114	98	98	98	98	98	101	212	1,290	990	466	74
2	114	98	98	98	98	98	101	218	1,290	930	515	74
3	114	98	98	98	98	98	101	222	1,360	870	466	74
4	114	98	98	98	98	98	101	226	1,360	870	490	74
5	114	98	98	98	98	98	101	231	1,360	810	442	74
6	114	98	98	98	98	98	101	257	1,420	810	378	74
7	114	98	98	98	98	98	101	257	1,420	728	244	74
8	114	98	98	98	98	98	101	287	1,420	755	231	74
9	114	98	98	98	98	98	101	287	1,420	728	208	74
10	114	98	98	98	98	98	101	287	1,420	700	158	74
11	114	98	98	98	98	98	101	287	1,420	755	122	74
12	114	98	98	98	98	98	101	287	1,360	728	114	74
13	114	98	98	98	98	98	106	287	1,360	645	106	74
14	114	98	98	98	98	98	106	287	1,360	672	103	74
15	114	98	98	98	98	98	106	321	1,360	645	98	74
16	114	98	98	98	98	98	112	358	1,360	672	98	74
17	114	98	98	98	98	98	119	398	1,290	645	98	74
18	114	98	98	98	98	98	125	442	1,230	700	98	74
19	114	98	98	98	98	98	132	442	1,230	672	98	68
20	106	98	98	98	98	98	138	540	1,230	645	90	68
21	106	98	98	98	98	98	145	540	1,170	590	90	68
22	106	96	98	98	98	98	152	810	1,110	645	83	64
23	106	98	98	98	98	98	158	1,110	1,110	565	83	62
24	106	98	98	98	98	98	165	1,170	1,110	645	83	62
25	106	98	98	98	98	98	172	1,230	1,050	618	76	62
26	106	98	98	98	98	98	179	1,230	1,050	618	76	62
27	106	98	98	98	98	98	186	1,230	990	540	76	62
28	106	98	98	98	98	98	193	1,230	990	590	76	62
29	106	98	98	98	.....	98	200	1,290	990	515	76	62
30	106	98	98	98	.....	98	205	1,290	930	442	76	62
31	106	.....	98	98	.....	98	.....	1,290	.....	490	76	.....

NOTE.—Daily discharge computed from a well-defined rating curve; Apr. 16 to May 4, estimated. Estimates for October, November, and December differ from those published in Water-Supply Paper 325 because of a slight revision of rating curve below gage height 0.6 foot, and estimates of daily discharge below this stage as published in that report should be revised by persons using them. At gage height 0.42 foot (the minimum stage which occurred in 1912) the revised rating curve gives a discharge about 4½ per cent less than that published in Water-Supply Paper 325.

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Monthly discharge of Vermilion River below Lake Vermilion, near Tower, Minn., for the year ending Sept. 30, 1913.

[Drainage area, 507 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	114	106	111	0.219	0.25	B.
November	98	98	98	.193	.22	B.
December	98	98	98	.193	.22	B.
January	98	98	98	.193	.22	B.
February	98	98	98	.193	.20	B.
March	98	98	98	.193	.22	B.
April	a 205	101	130	.256	.29	C.
May	1,290	a 212	598	1.18	1.36	B.
June	1,420	930	1,250	2.47	2.76	A.
July	990	442	685	1.35	1.56	A.
August	515	76	177	.349	.40	A.
September	74	62	69.9	.138	.15	B.
The year	1,420	62	293	.578	7.85	

a Estimated.

LITTLE FORK RIVER AT LITTLE FORK, MINN.

Location.—In sec. 9, T. 68 N., R. 25 W., at the lower of the two highway bridges in Little Fork, 1½ miles above mouth of Beaver Brook.

Records available.—June 23, 1909, to September 30, 1913.

Drainage area.—1,720 square miles.

Gage.—Vertical staff; read morning and evening to quarter-tenths. Limits of use: Hundredths below 5.0, half-tenths from 5.0 to 6.0, and tenths above 6.0 feet.

Channel and control.—Practically permanent.

Discharge measurements.—Made from bridge.

Winter flow.—Determined by measurements made through the ice; river frozen over at station during winter.

Regulation.—River used throughout spring and summer for log driving. No logging dams on river; flow is natural.

Accuracy.—Conditions at station are favorable and records of flow should be reliable except for temporary backwater from log jams at railroad bridge below gage.

Discharge measurements of Little Fork River at Little Fork, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 19	S. B. Soulé	5.82	a 113	May 1	S. B. Soulé	13.32	b 3,560
Jan. 15	do	5.58	a 78.6	July 30	B. J. Peterson	6.88	598
Feb. 18	do	5.50	53.3				

a Complete ice cover.

b Logs running during measurement, but not lodged anywhere.

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Daily gage height, in feet, of Little Fork River at Little Fork, Minn., for the year ending Sept. 30, 1913.

[Herman I. Mous, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	8.0	6.0	.....	.....	.....	.....	.....	13.3	13.2	8.8	6.5	5.8
2	7.9	6.0	.....	5.9	.....	.....	.....	12.4	13.3	8.6	6.1	5.8
3	7.6	6.0	.....	.....	.....	.....	6.6	12.3	12.9	8.4	5.75	5.9
4	7.4	6.0	.....	.....	.....	.....	.....	12.7	12.4	8.1	5.6	6.0
5	7.2	6.0	6.0	.....	.....	.....	.....	13.2	11.8	8.8	5.7	6.0
6	7.1	6.0	.....	.....	5.5	5.7	.....	13.2	12.4	9.2	5.7	6.1
7	7.1	6.0	.....	.....	.....	.....	.....	13.0	14.2	9.4	5.75	6.2
8	6.8	6.0	.....	.....	.....	.....	.....	12.2	15.6	9.2	5.8	6.3
9	6.6	6.0	.....	6.0	.....	.....	.....	12.0	15.5	8.6	5.85	6.3
10	6.8	6.0	.....	.....	.....	.....	8.7	11.4	14.3	7.9	5.8	6.6
11	6.8	6.0	.....	.....	.....	.....	8.9	10.6	13.2	7.6	5.9	6.8
12	6.7	5.95	5.75	.....	.....	.....	8.8	10.4	12.8	8.0	5.9	7.2
13	6.8	5.95	.....	.....	5.5	5.9	12.6	10.2	11.8	9.4	5.9	7.0
14	6.6	5.9	.....	.....	.....	.....	16.4	10.0	11.0	9.5	5.9	6.9
15	6.7	5.9	.....	5.6	.....	.....	17.2	10.2	9.8	9.4	5.9	6.8
16	6.7	5.9	.....	5.6	.....	.....	18.2	10.6	9.4	9.4	5.85	6.9
17	6.6	6.2	.....	.....	.....	.....	16.6	13.4	9.7	9.6	5.85	6.8
18	6.5	6.4	.....	.....	5.5	.....	15.8	16.4	9.4	9.9	5.75	6.8
19	6.4	6.4	5.7	.....	.....	.....	15.4	16.1	9.4	10.0	5.7	6.6
20	6.4	6.4	.....	.....	5.5	6.1	15.0	15.7	9.0	9.6	5.65	6.5
21	6.2	6.3	.....	.....	.....	.....	14.0	13.6	9.0	9.4	5.8	6.4
22	6.3	6.2	.....	.....	.....	.....	13.7	13.8	8.9	9.3	6.2	6.4
23	6.3	6.1	.....	5.6	.....	.....	13.9	14.5	8.6	9.2	6.0	6.4
24	6.2	6.1	.....	.....	.....	.....	14.0	14.4	8.2	9.0	5.95	6.3
25	6.1	6.2	.....	.....	.....	.....	14.3	13.7	7.8	8.7	5.9	6.3
26	6.1	6.3	5.9	.....	.....	.....	15.6	12.5	7.8	8.2	5.95	6.3
27	5.95	6.3	.....	.....	5.7	6.2	16.4	11.5	7.6	7.6	5.9	6.3
28	5.8	6.3	.....	.....	.....	.....	16.1	10.8	8.1	7.2	5.9	6.3
29	6.1	6.3	.....	.....	.....	.....	15.2	11.1	8.4	7.0	5.9	6.3
30	6.1	6.2	.....	.....	.....	.....	14.2	11.8	8.6	6.8	5.9	6.3
31	6.0	.....	.....	5.5	.....	.....	.....	12.7	.....	6.7	5.8	.....

NOTE.—Discharge relation probably affected by ice about Nov. 17, 1912, to Apr. 16, 1913..

Daily discharge, in second-feet, of Little Fork River at Little Fork, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,030	341	.....	.....	.....	.....	.....	3,540	3,490	1,360	482	289
2	989	341	.....	.....	.....	.....	.....	3,060	3,540	1,280	368	289
3	870	341	.....	.....	.....	.....	.....	3,010	3,320	1,190	276	315
4	793	341	.....	.....	.....	.....	.....	3,220	3,060	1,070	240	341
5	719	341	.....	.....	.....	.....	.....	3,490	2,760	1,360	264	341
6	683	341	.....	.....	.....	.....	.....	3,490	3,060	1,540	264	368
7	683	341	.....	.....	.....	.....	.....	3,380	4,040	1,630	276	395
8	578	341	.....	.....	.....	.....	.....	2,960	4,810	1,540	289	423
9	513	341	.....	.....	.....	.....	.....	2,860	4,760	1,280	302	423
10	578	341	.....	.....	.....	.....	.....	2,560	4,100	989	289	513
11	578	341	.....	.....	.....	.....	.....	2,180	3,490	870	315	578
12	545	328	.....	.....	.....	.....	.....	2,080	3,270	1,030	315	719
13	578	328	.....	.....	.....	.....	.....	2,000	2,760	1,640	315	647
14	513	315	.....	.....	.....	.....	.....	1,900	2,360	1,680	315	612
15	545	315	.....	.....	.....	.....	.....	2,000	1,820	1,640	315	578
16	545	315	.....	.....	.....	.....	.....	2,180	1,640	1,640	302	612
17	513	.....	.....	.....	.....	.....	5,360	3,600	1,770	1,720	302	578
18	482	.....	.....	.....	.....	.....	4,920	5,250	1,640	1,860	276	578
19	452	.....	.....	.....	.....	.....	4,700	5,080	1,640	1,900	264	513
20	452	.....	.....	.....	.....	.....	4,480	4,860	1,460	1,720	252	482
21	395	.....	.....	.....	.....	.....	3,930	3,710	1,460	1,640	289	452
22	423	.....	.....	.....	.....	.....	3,760	3,820	1,410	1,590	395	452
23	423	.....	.....	.....	.....	.....	3,880	4,200	1,280	1,540	341	452
24	395	.....	.....	.....	.....	.....	3,930	4,150	1,110	1,460	328	423
25	368	.....	.....	.....	.....	.....	4,100	3,760	949	1,320	315	423
26	368	.....	.....	.....	.....	.....	4,810	3,110	949	1,110	328	423
27	328	.....	.....	.....	.....	.....	5,250	2,610	870	870	315	423
28	289	.....	.....	.....	.....	.....	5,080	2,260	1,070	719	315	423
29	368	.....	.....	.....	.....	.....	4,590	2,410	1,190	647	315	423
30	368	.....	.....	.....	.....	.....	4,040	2,760	1,280	578	315	423
31	341	.....	.....	.....	.....	.....	.....	3,220	.....	545	289	.....

NOTE.—Daily discharge computed from a well-defined rating curve. Discharge estimated, because of ice, from gage heights, observer's notes, 3 discharge measurements, and climatic records, as follows: Nov. 17-30, 300 second-feet; Dec. 1-18, 180 second-feet; Dec. 19-31, 105 second-feet; Jan. 1-14, 90 second-feet; Jan. 15-31, 75 second-feet; Feb. 1-17, 60 second-feet; Feb. 18-28, 55 second-feet; Mar. 1-31, 85 second-feet; Apr. 1-9, 100 second-feet; and Apr. 10-16, 1,500 second-feet.

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Monthly discharge of Little Fork River at Little Fork, Minn., for the year ending Sept. 30, 1913.

[Drainage area, 1,720 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	1,030	341	539	0.313	0.36	B.
November	.....	.....	318	.185	.21	C.
December	.....	.....	150	.087	.10	C.
January	.....	.....	82	.048	.06	C.
February	.....	.....	58	.034	.04	C.
March	.....	.....	85	.049	.06	D.
April	.....	.....	2,470	1.44	1.61	C.
May	5,250	1,900	3,180	1.85	2.13	B.
June	4,810	870	2,350	1.37	1.53	B.
July	1,900	545	1,320	.767	.88	A.
August	482	240	309	.180	.21	A.
September	719	289	464	.270	.30	A.
The year	.....	.....	946	.550	7.49	

UPPER MISSISSIPPI RIVER DRAINAGE BASIN.

MISSISSIPPI RIVER ABOVE SANDY RIVER, NEAR LIBBY, MINN.

Location.—In sec. 25, T. 50 N., R. 24 W., a short distance above the mouth of Sandy River, near Libby post office, in Aitkin County.

Records available.—September 1, 1895, to September 30, 1913.

Drainage area.—4,510 square miles.

Gage.—Vertical staff.

Discharge measurements.—Made by an employee of the United States Engineer Corps, stationed at Sandy Lake dam.

Regulation.—Flow controlled in the interest of navigation by three reservoirs, namely, Lake Winnibigoshish, Leech Lake, and Pokegama Falls.

Cooperation.—Station maintained by United States Engineer Corps for the purpose of determining the flow of the river above Sandy Lake reservoir.

Daily discharge, in second-feet, of Mississippi River above Sandy River, near Libby, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2,440	1,460	918	563	534	636	654	2,040	2,270	2,470	1,840	1,570
2	2,340	1,420	895	563	527	633	676	2,040	2,260	2,350	1,820	1,630
3	2,240	1,380	853	563	520	630	696	2,040	2,260	2,230	1,790	1,700
4	2,140	1,340	820	563	513	628	716	2,040	2,260	2,110	1,760	1,760
5	2,040	1,300	787	563	506	625	738	2,040	2,260	1,990	1,740	1,820
6	1,940	1,260	755	563	499	622	758	2,040	2,260	1,870	1,710	1,880
7	1,930	1,220	722	563	495	620	778	2,040	2,250	1,750	1,680	1,890
8	1,930	1,180	690	562	493	617	798	2,040	2,250	1,630	1,660	1,900
9	1,930	1,150	657	560	508	614	834	2,020	2,250	1,820	1,690	1,910
10	1,930	1,110	624	557	523	611	869	2,000	2,250	2,000	1,720	1,920
11	1,920	1,070	592	555	538	608	905	1,980	2,270	2,180	1,750	1,930
12	1,920	1,030	559	552	553	600	940	1,970	2,290	2,360	1,780	1,940
13	1,920	990	523	550	578	593	976	1,950	2,320	2,540	1,810	1,900
14	1,920	988	522	547	588	586	1,010	1,930	2,340	2,720	1,840	1,860
15	1,920	986	521	545	598	579	1,050	1,920	2,360	2,910	1,870	1,820
16	1,910	983	521	542	585	572	1,090	1,900	2,380	3,090	1,900	1,780
17	1,850	981	520	545	571	564	1,120	2,010	2,400	3,270	1,890	1,740
18	1,780	979	519	549	558	557	1,160	2,120	2,430	3,450	1,870	1,700
19	1,720	976	518	552	544	550	1,250	2,220	2,450	3,300	1,850	1,660
20	1,650	974	517	556	531	543	1,340	2,330	2,470	3,130	1,830	1,620
21	1,590	972	516	559	518	551	1,430	2,440	2,500	2,960	1,810	1,580
22	1,520	970	520	563	503	559	1,520	2,540	2,510	2,790	1,790	1,540
23	1,520	967	525	567	525	567	1,610	2,650	2,520	2,620	1,770	1,520
24	1,520	965	530	570	548	575	1,700	2,600	2,530	2,430	1,760	1,490
25	1,510	963	534	574	560	583	1,800	2,550	2,540	2,260	1,720	1,470
26	1,510	960	538	569	583	591	1,850	2,500	2,550	2,200	1,680	1,450
27	1,510	958	543	563	606	600	1,900	2,460	2,560	2,130	1,650	1,420
28	1,500	955	548	558	638	608	1,940	2,410	2,570	2,070	1,620	1,400
29	1,500	953	552	552	.....	617	1,990	2,370	2,580	2,000	1,580	1,370
30	1,500	950	557	546	.....	626	2,040	2,320	2,590	1,940	1,540	1,350
31	1,500	.....	563	541	.....	634	.....	2,270	.....	1,870	1,510	.....

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Monthly discharge of Mississippi River above Sandy River near Libby, Minn., for the year ending Sept. 30, 1913.

Month.	Discharge in second-feet.			Run-off (total in millions of cubic feet).
	Maximum.	Minimum.	Mean.	
October	2,440	1,500	1,810	4,850
November	1,460	950	1,080	2,800
December	918	516	611	1,640
January	574	541	557	1,490
February	638	493	544	1,320
March	636	543	597	1,600
April	2,040	654	1,200	3,110
May	2,650	1,900	2,190	5,860
June	2,590	2,250	2,390	6,190
July	3,450	1,630	2,400	6,430
August	1,900	1,510	1,750	4,690
September	1,940	1,350	1,680	4,350
The year	3,450	493	1,410	44,300

NOTE.—Computed by engineers of the United States Geological Survey from daily discharge record furnished by the United States Engineer Corps.

MISSISSIPPI RIVER AT ANOKA, MINN.

Location.—At highway bridge connecting Anoka with Champlain, a short distance above mouth of Rum River.

Records available.—November 3, 1896, to September 10, 1897 (United States Engineer Corps records); May 8, 1905, to December 31, 1913, when station was discontinued.

Drainage area.—17,100 square miles.

Gage.—Chain gage; read morning and evening to half-tenths. Limits of use: Half-tenths below and tenths above −0.7 foot. Staff gage prior to 1909; datum of chain gage same as that used by United States Engineer Corps in 1896 and 1897.

Channel and control.—Practically permanent; control temporarily changed for a few days at a time by log jams.

Discharge measurements.—Made from bridge.

Winter flow.—Affected by ice; regular observations discontinued. Monthly discharge during winter based on records of flow kept by United States Engineer Corps at Lock and Dam No. 2 below Minneapolis, allowance being made for increase in flow between the different points.

Regulation.—Nearest dam located at Minneapolis but, because of the fall between the two points, does not influence Anoka station. The first dam above Anoka is at St. Cloud. The flow of the river is controlled by Government dams on the upper river at Lake Winnibigoshish, Leech Lake, Pokegama Falls, Sandy Lake, Pine River, and Gull Lake, for the purpose of increasing the low-water, open-season flow in the interest of navigation. River is used extensively for log driving, but there is very little backwater from log jams below the station, except for a few days at a time. Beginning December 21 the discharge relation was affected by new dam at Coon Creek Rapids.

Accuracy.—Records reliable. No measurements made during 1907 and 1908, but those made subsequently indicate no great change in rating curve as developed in 1897, 1905, and 1906; therefore it can be applied to all gage heights since establishment of station.

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Discharge measurements of Mississippi River at Anoka, Minn., during the period Oct. 1, 1912, to Dec. 31, 1913.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 9	Hoyt and Soulé	0.81	a 6,280
Oct. 23	S. B. Soulé	.89	6,430

a Logs running; control apparently clear.

Daily gage height, in feet, of Mississippi River at Anoka, Minn., during the period Oct. 1, 1912, to Dec. 31, 1913.

[B. J. Witte, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.1	−0.2						1.0	1.2	0.3	1.0	0.3	0.4	0.8	0.6
2	.1	− .2						.8	1.2	.4	.9	.4	.4	.7	.6
3	.2	− .2						.9	1.0	e.4	.8	.4	.2	.7	.6
4	.2	− .2					0.0	1.1	.8	1.2	.4	.4	.3	.8	.7
5	.2	− .2					.3	.8	1.0	1.0	.6	.3	.1	.7	.6
6	.2	− .3					.3	.8	.8	.8	.4	.4	.4	.7	.6
7	.2	− .3					.0	.7	.6	1.2	.6	.3	.4	.7	.2
8	.1	− .2					.1	.6	.4	1.5	.4	.5	.6	.8	.2
9	.1	− .3					.3	.7	.2	1.6	.6	.4	.4	.7	.1
10	.2	− .4					.2	.6	.3	1.4	.5	.7	.6	.7	.0
11	.2	− .4					.2	.6	.3	1.4	.5	.9	.8	.6	.1
12	.3	− .3					.3	.6	.2	1.4	.5	1.0	1.2	.5	.0
13	.2	− .4					.3	.6	.2	1.4	.5	.8	1.2	.2	−.1
14	.1	− .5					.3	.6	.2	1.6	.3	.9	1.5	.2	.0
15	.1	− .4					.3	.6	.1	1.7	.4	.9	1.4	.2	.1
16	.0	− .4					.2	.8	.2	2.1	.3	1.0	1.5	.2	.1
17	.1	− .4					.3	.8	.2	2.0	.5	.8	1.6	.1	.2
18	.1	− .5					.3	1.2	.3	2.0	.5	.9	1.4	.0	.2
19	.1	− .4					.1	1.2	.4	2.1	.6	.7	1.4	.2	.1
20	.2	− .4					− .1	1.5	.4	2.0	.5	.7	1.1	.3	.1
21	.2	− .4					.4	1.8	.4	1.9	.6	.6	1.2	.4	2.6
22	.3	− .4					.4	1.9	.4	1.9	.6	.6	1.0	.4	2.8
23	.2	− .4					.2	2.0	.3	1.8	.7	.5	.9	.3	2.4
24	.3	− .5					.5	2.0	.4	1.7	.7	.7	.9	.2	2.5
25	.1	− .6					.6	2.0	.4	1.5	.9	.5	.8	.5	2.4
26	.0	− .8					.7	2.1	.4	1.5	.8	.6	.7	.6	2.2
27	− .1	− .7					.7	1.8	.4	1.4	.8	.5	.6	.6	2.2
28	− .2	− .8					.8	1.8	.4	1.4	.6	.6	.7	.7	2.1
29	− .2	− .8					.9	1.6	.4	1.4	.6	.2	.8	.7	2.1
30	− .3	− .6					1.0	1.5	.4	1.3	.6	.4	.6	.8	2.2
31	− .2							1.4		1.2	.5		.7		2.0

NOTE.—Discharge relation probably affected by ice about Dec. 1, 1912, to Mar. 31, 1913, and Dec. 21-31, 1913.

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Daily discharge, in second-feet, of Mississippi River at Anoka, Minn., for the period Oct. 1, 1912, to Dec. 21, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4,290	3,690	.....	.....	.....	.....	4,080	6,780	7,520	4,740	6,780	4,740
2	4,290	3,690	.....	.....	.....	.....	4,080	6,110	7,520	4,980	6,440	4,980
3	4,510	3,690	.....	.....	.....	.....	4,080	6,440	6,780	4,980	6,110	4,980
4	4,510	3,690	.....	.....	.....	.....	4,080	7,140	6,110	7,520	4,980	4,980
5	4,510	3,690	.....	.....	.....	.....	4,740	6,110	6,780	6,780	5,510	4,740
6	4,510	3,510	.....	.....	.....	.....	4,740	6,110	6,110	6,110	4,980	4,980
7	4,510	3,510	.....	.....	.....	.....	4,080	5,800	5,510	7,520	5,510	4,740
8	4,290	3,690	.....	.....	.....	.....	4,290	5,510	4,980	8,700	4,980	5,240
9	4,290	3,510	.....	.....	.....	.....	4,740	5,800	4,510	9,100	5,510	4,980
10	4,510	3,340	.....	.....	.....	.....	4,510	5,510	4,740	8,300	5,240	5,800
11	4,510	3,340	.....	.....	.....	.....	4,510	5,510	4,740	8,300	5,240	6,440
12	4,740	3,510	.....	.....	.....	.....	4,740	5,510	4,510	8,300	5,240	6,780
13	4,510	3,340	.....	.....	.....	.....	4,740	5,510	4,510	8,300	5,240	6,110
14	4,290	3,180	.....	.....	.....	.....	4,740	5,510	4,510	9,100	4,740	6,440
15	4,290	3,340	.....	.....	.....	.....	4,740	5,510	4,290	9,500	4,980	6,440
16	4,080	3,340	.....	.....	.....	.....	4,510	6,110	4,510	11,200	4,740	6,780
17	4,290	3,340	.....	.....	.....	.....	4,740	6,110	4,510	10,700	5,240	6,110
18	4,290	3,180	.....	.....	.....	.....	4,740	7,520	4,740	10,700	5,240	6,440
19	4,290	3,340	.....	.....	.....	.....	4,290	7,520	4,980	11,200	5,510	5,800
20	4,510	3,340	.....	.....	.....	.....	3,880	8,700	4,980	10,700	5,240	5,800
21	4,510	3,340	.....	.....	.....	.....	4,980	9,910	4,980	10,300	5,510	5,510
22	4,740	3,340	.....	.....	.....	.....	4,980	10,300	4,980	10,300	5,510	5,510
23	4,510	3,340	.....	.....	.....	.....	4,510	10,700	4,740	9,910	5,800	5,240
24	4,740	3,180	.....	.....	.....	.....	5,240	10,700	4,980	9,500	5,800	5,800
25	4,290	3,030	.....	.....	.....	.....	5,510	10,700	4,980	8,700	6,440	5,240
26	4,080	2,760	.....	.....	.....	.....	5,800	11,200	4,980	8,700	6,110	5,510
27	3,880	2,890	.....	.....	.....	.....	5,800	9,910	4,980	8,300	6,110	5,240
28	3,690	2,760	.....	.....	.....	.....	6,110	9,910	4,980	8,300	5,510	5,510
29	3,690	2,760	.....	.....	.....	.....	6,440	9,100	4,980	8,300	5,510	4,510
30	3,510	3,030	.....	.....	.....	.....	6,780	8,700	4,980	7,910	5,510	4,980
31	3,690	.....	.....	.....	.....	.....	.....	8,300	.....	7,520	5,240	.....

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	4,980	6,110	5,510	16	8,700	4,510	4,290
2	4,980	5,800	5,510	17	9,100	4,290	4,510
3	4,510	5,800	5,510	18	8,300	4,080	4,510
4	4,740	6,110	5,800	19	8,300	4,510	4,290
5	4,290	5,800	5,510	20	7,140	4,740	4,290
6	4,980	5,800	5,510	21	7,520	4,980	.....
7	4,980	5,800	4,510	22	6,780	4,980	.....
8	5,510	6,110	4,510	23	6,440	4,740	.....
9	4,980	5,800	4,290	24	6,440	4,510	.....
10	5,510	5,800	4,080	25	6,110	5,240	.....
11	6,110	5,510	4,290	26	5,800	5,510	.....
12	7,520	5,240	4,080	27	5,510	5,510	.....
13	7,520	4,510	3,880	28	5,800	5,800	.....
14	8,700	4,510	4,080	29	6,110	5,800	.....
15	8,300	4,510	4,290	30	5,510	6,110	.....
				31	5,800	.....	.....

NOTE.—Daily discharge computed from a rating curve well defined between 3,180 and 29,700 second-feet (gage heights —0.5 and 6.0 feet). Discharge estimated, because of ice, from the flow of the Mississippi at Dam No. 2 as determined by the United States Engineer Corps, minus the flow of Rum River at Cambridge, and the estimated inflow from the remaining drainage area between Anoka and Dam No. 2, as follows: Dec. 1–31, 1912, 2,640 second-feet; Jan. 1–31, 1913, 2,260 second-feet; Feb. 1–28, 1,910 second-feet; Mar. 1–31, 2,400 second-feet; and Dec. 21–31, 1913, 4,290 second-feet.

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Monthly discharge of Mississippi River at Anoka, Minn., from Oct. 1, 1912, to Dec. 31, 1913.

Month.	Discharge in second-feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
1912-13.				
October	4,740	3,510	4,300	B.
November	3,690	2,760	3,320	C.
December	.....	.....	2,640	D.
January	.....	.....	2,260	
February	.....	.....	1,910	
March	.....	.....	2,400	
April	6,780	3,880	4,840	C.
May	11,200	5,510	7,560	A.
June	7,520	4,290	5,210	B.
July	11,200	4,740	8,530	A.
August	6,780	4,740	5,500	A.
September	6,780	4,510	5,540	B.
The year	11,200	.....	4,520	
1913.				
October	9,100	4,290	6,350	A.
November	6,110	4,080	5,280	B.
December	.....	.....	4,530	C.

MISSISSIPPI RIVER AT ST. PAUL, MINN.

Location.—Near foot of Robert Street, St. Paul, 6 miles below mouth of Minnesota River.

Records available.—March 1, 1892, to September 30, 1913. Gage heights by United States Singal Service (later United States Weather Bureau) 1873 to 1913; many discharge measurements by United States Engineer Corps prior to 1900; measurements by United States Geological Survey 1909 to 1913.

Drainage area.—35,700 square miles.

Gage.—Chain gage, read once daily to tenths, installed May 9, 1913, on Chicago & Great Western Railroad bridge, about 800 feet below vertical staff gage near foot of Wabasha Street used until that date. Previous to 1911 a vertical staff was located on the Diamond Joe Line wharf at the foot of Jackson Street, about 400 feet below the present chain gage. At the lower end of the wharf is the United States Engineer Corps gage, the datum of which is 0.5 foot higher than that of the Weather Bureau gage, to which all data herein are referred.

Channel and control.—No well-defined control; channel shifts somewhat from year to year.

Discharge measurements.—Made from the Omaha Railway bridge 2 miles above the station.

Winter flow.—River frozen from December to March.

Regulation.—Flow is regulated to a certain extent by Government reservoirs on headwaters at Lake Winnibigoshish, Leech Lake, Pokegama Falls, Sandy Lake, Pine River, and Gull Lake, but effect of these reservoirs is very gradual at St. Paul. Possibly the shutting of the wheel gates of the nearest dam at Minneapolis may cause some daily fluctuations of stage at St. Paul during extreme low water.

Maximum and minimum flow.—Highest recorded discharge, 117,000 second-feet, occurred July 22, 1867; highest discharge since 1892, 80,800 second-feet; winter flow has fallen nearly as low as 1,000 second-feet.

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Accuracy.—As the Weather Bureau gage is read once a day, the recorded mean gage height for the day may be somewhat in error, although occasional additional readings have shown this error was not very serious, largely because of the natural storage of the river channel between the Minneapolis dam and St. Paul. Previous to 1900 the United States Engineer Corps made many discharge measurements at St. Paul, the results of which are published by the Mississippi River Commission. Although the base data for estimating the daily flow of the river are available for years prior to 1892, the reservoir system was not then in complete operation, and as this system has had marked influence on the regimen of the river it is evident that the earlier records have lost much of their value as indications of probable future flow.

Cooperation.—Gage heights furnished by the United States Weather Bureau. Data on which mean monthly flow from January to March has been estimated furnished by United States Engineer Corps.

Discharge measurements of Mississippi River at St. Paul, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 28	Hoyt and Soulé	0.38	3,830	June 24	Soulé and Peterson	1.94	6,160
May 14	do	3.16	8,570	Sept. 12	Hoyt and Soulé	3.01	8,230

Daily gage height, in feet, of Mississippi River at St. Paul, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.4	0.8	−0.3	0.0	−0.2	0.3	1.9	4.1	5.0	2.3	3.2	1.7
2	1.4	.8	.2	− .1	.2	.4	2.2	4.0	4.8	2.6	3.0	1.5
3	1.4	.9	.0	.8	.4	.3	2.4	4.2	4.5	2.7	2.8	1.6
4	1.3	.9	.0	1.1	.4	.6	2.3	4.1	4.2	3.1	2.7	2.0
5	1.4	.7	.2	.2	.4	.8	2.2	4.1	4.0	3.6	2.5	1.9
6	1.4	.6	.0	.3	.5	−.2	2.4	3.9	4.7	3.5	2.4	1.8
7	1.3	.7	−1.0	.5	.4	.6	2.9	3.9	3.6	3.5	2.4	1.7
8	1.3	.6	− .5	.5	.4	.3	2.5	3.7	3.2	3.5	2.3	1.6
9	1.3	.5	1.1	.3	.4	.7	1.9	3.7	2.8	3.8	2.0	1.6
10	1.3	.5	.5	.4	.5	.8	2.3	3.7	2.8	3.7	2.0	1.7
11	1.2	.5	.8	.3	.4	.7	2.4	3.6	2.7	3.7	1.9	2.6
12	1.4	.5	.8	.2	.4	.6	2.6	3.5	2.4	3.8	1.8	2.8
13	1.4	.4	1.1	.3	.5	.4	2.6	3.3	2.2	3.7	1.9	2.9
14	1.4	.4	1.0	.2	.3	.8	2.9	3.0	2.1	3.7	1.8	2.9
15	1.3	.4	1.0	.4	.4	.7	3.1	3.3	2.0	3.7	1.8	2.6
16	1.3	.5	1.5	.5	.5	1.0	3.6	3.5	1.7	3.7	1.8	2.5
17	1.3	.6	.2	.5	.6	1.5	3.7	3.6	1.6	4.2	1.6	2.5
18	1.2	.5	.0	.3	.4	1.1	4.0	3.5	1.7	4.7	1.4	2.5
19	1.1	.5	− .2	.4	.3	1.2	3.9	4.0	1.8	4.8	1.8	2.5
20	1.2	.4	− .2	.6	.2	.9	4.1	4.5	2.0	4.8	1.9	2.8
21	1.2	.4	.1	.5	.4	.5	3.5	4.8	2.1	4.8	2.0	2.8
22	1.2	.4	.7	.5	.0	.5	4.0	5.1	2.0	4.5	2.1	2.5
23	1.0	.5	.9	.4	.3	.4	3.9	5.4	1.7	4.5	2.0	2.4
24	1.0	.5	.7	.3	.0	.5	3.8	5.7	1.7	4.4	2.0	2.2
25	1.1	.4	.5	.4	.2	.7	3.6	5.9	1.9	4.1	2.5	2.2
26	1.2	.3	.4	.4	.5	.8	3.6	6.0	2.2	3.9	2.6	2.2
27	1.1	.0	.4	.3	.1	.6	3.8	6.1	2.3	3.9	2.7	2.1
28	1.1	− .2	.1	.3	.0	.5	3.7	6.1	2.3	3.6	2.8	2.0
29	1.2	− .2	− .1	.6	.....	.4	4.1	5.9	2.2	3.5	2.5	2.0
30	1.0	− .3	.2	.5	.....	.5	4.2	5.6	2.3	3.5	2.2	1.9
31	.9	.....	.1	.0	.....	1.4	.....	5.3	.....	3.4	2.0	.....

NOTE.—Discharge relation probably affected by ice about Dec. 1, 1912, to Mar. 31, 1913.

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Daily discharge, in second-feet, of Mississippi River at St. Paul, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	5,170	4,290	.....	.....	.....	.....	6,090	10,600	12,800	6,820	8,630	5,730
2	5,170	4,290	.....	.....	.....	.....	6,630	10,400	12,200	7,400	8,210	5,390
3	5,170	4,420	.....	.....	.....	.....	7,010	10,800	11,500	7,600	7,800	5,560
4	5,000	4,420	.....	.....	.....	.....	6,820	10,600	10,800	8,420	7,600	6,270
5	5,170	4,160	.....	.....	.....	.....	6,630	10,600	10,400	9,480	7,200	6,090
6	5,170	4,040	.....	.....	.....	.....	7,010	10,100	9,700	9,260	7,010	5,910
7	5,000	4,160	.....	.....	.....	.....	8,000	10,100	9,480	9,260	7,010	5,730
8	5,000	4,040	.....	.....	.....	.....	7,200	9,700	8,630	9,260	6,820	5,560
9	5,000	3,920	.....	.....	.....	.....	6,090	9,700	7,800	9,920	6,270	5,560
10	5,000	3,920	.....	.....	.....	.....	6,820	9,700	7,800	9,700	6,270	5,730
11	4,840	3,920	.....	.....	.....	.....	7,010	9,480	7,600	9,700	6,090	7,400
12	5,170	3,920	.....	.....	.....	.....	7,400	9,260	7,010	9,920	5,910	7,800
13	5,170	3,800	.....	.....	.....	.....	7,400	8,840	6,630	9,700	6,090	8,000
14	5,170	3,800	.....	.....	.....	.....	8,000	8,210	6,450	9,700	5,910	8,000
15	5,000	3,800	.....	.....	.....	.....	8,420	8,840	6,270	9,700	5,910	7,400
16	5,000	3,920	.....	.....	.....	.....	9,480	9,260	5,730	9,700	5,910	7,200
17	5,000	4,040	.....	.....	.....	.....	9,700	9,480	5,560	10,800	5,560	7,200
18	4,840	3,920	.....	.....	.....	.....	10,400	9,260	5,730	12,000	5,220	7,200
19	4,690	3,920	.....	.....	.....	.....	10,100	10,400	5,910	12,200	5,910	7,200
20	4,840	3,800	.....	.....	.....	.....	10,600	11,500	6,270	12,200	6,090	7,800
21	4,840	3,800	.....	.....	.....	.....	9,260	12,200	6,450	12,200	6,270	7,800
22	4,840	3,800	.....	.....	.....	.....	10,400	13,000	6,270	11,500	6,450	7,200
23	4,550	3,920	.....	.....	.....	.....	10,100	13,800	5,730	11,500	6,270	7,010
24	4,550	3,920	.....	.....	.....	.....	9,920	14,600	5,730	11,300	6,270	6,630
25	4,690	3,800	.....	.....	.....	.....	9,480	15,200	6,090	10,600	7,200	6,630
26	4,840	3,680	.....	.....	.....	.....	9,480	15,500	6,630	10,100	7,400	6,630
27	4,690	3,330	.....	.....	.....	.....	9,920	15,800	6,820	10,100	7,600	6,450
28	4,690	3,120	.....	.....	.....	.....	9,700	15,800	6,820	9,480	7,800	6,270
29	4,840	3,120	.....	.....	.....	.....	10,600	15,200	6,630	9,260	7,200	6,270
30	4,550	3,030	.....	.....	.....	.....	10,800	14,400	6,820	9,260	6,630	6,090
31	4,420	.....	.....	.....	.....	.....	.....	13,600	.....	9,050	6,270	.....

NOTE.—Daily discharge computed from two well-defined rating curves. New rating curve used beginning Apr. 1, 1913. Discharge estimated because of ice, from discharge at lock and dam No. 2, from records of United States Engineer Corps, and flow at Mankato, as follows: Dec. 1–31, 3,170 second-feet; Jan. 1–31, 2,770 second-feet; Feb. 1–28, 2,350 second-feet; and Mar. 1–31, 3,770 second-feet.

Monthly discharge of Mississippi River at St. Paul, Minn., for the year ending Sept. 30, 1913.

Month.	Discharge in second-feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
October	5,170	4,420	4,910	C.
November	4,420	3,030	3,870	C.
December	.....	.....	3,170	D.
January	.....	.....	2,770	
February	.....	.....	2,350	
March	.....	.....	3,770	
April	10,800	6,090	8,550	C.
May	15,800	8,210	11,500	B.
June	12,800	5,560	7,610	B.
July	12,200	6,820	9,910	B.
August	8,630	5,220	6,670	B.
September	8,000	5,390	6,660	B.
The year	15,800	.....	6,000	

NOTE.—Means for December to March, inclusive, based on records of United States Engineer Corps at lock and dam No. 2 below Minneapolis, allowance being made for flow of Minnesota River.

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SANDY RIVER BELOW SANDY LAKE RESERVOIR, MINN.

Location.—At the Sandy Lake dam, near Libby post office, in Aitkin County, 1 mile above the mouth of Sandy River.

Records available.—July 7, 1893, to September 30, 1913.

Drainage area.—424 square miles.

Area of reservoir behind dam.—At low stage 8 square miles; at high stage 16.5 square miles; these areas with a range of 9.4 feet give a capacity of 3,127,900,000 cubic feet.

Discharge measurements.—The discharge over the dam is computed from the the flow through the openings and from frequent discharge measurements made by an employee who resides near the dam. At extreme flood stages the Mississippi drowns out the dam and fills Sandy Lake reservoir as much as 3 feet higher than was intended. If the Mississippi is at fairly high stage and the dam is open there is frequently a considerable reverse flow into the reservoir, but the amount of this flow has not been computed.

Cooperation.—Station maintained by the United States Engineer Corps for the purpose of measuring the flow from the Sandy Lake reservoir, which is one unit in the Government reservoir system at the headwaters of the Mississippi.

Daily discharge, in second-feet, of Sandy River below Sandy Lake reservoir, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	0	5	5	5	5	5	5	5	10	200	140	499
2	0	5	5	5	5	5	5	5	10	200	78	501
3	5	5	5	5	5	5	5	5	10	201	502	499
4	5	5	5	5	5	5	5	5	10	202	501	502
5	5	5	5	5	5	5	5	5	10	202	500	499
6	5	5	5	5	5	5	5	5	10	100	499	500
7	5	5	5	5	5	5	5	5	10	99	502	501
8	5	5	5	5	5	5	5	5	10	102	500	500
9	5	5	5	5	5	5	5	5	10	101	501	501
10	5	5	5	5	5	5	5	5	10	103	501	499
11	5	5	5	5	5	5	5	5	200	100	500	500
12	5	5	5	5	5	5	5	5	350	102	500	500
13	5	5	5	5	5	5	5	5	202	100	500	500
14	5	5	5	5	5	5	5	5	200	76	502	501
15	5	5	5	5	5	5	5	5	202	52	502	499
16	5	5	5	5	5	5	5	5	198	53	501	500
17	5	5	5	5	5	5	5	5	201	52	499	501
18	5	5	5	5	5	5	5	5	202	52	502	499
19	5	5	5	5	5	5	5	5	199	171	502	499
20	5	5	5	5	5	5	5	5	201	386	499	502
21	5	5	5	5	5	5	5	5	201	460	500	500
22	5	5	5	5	5	5	5	5	202	476	502	500
23	5	5	5	5	5	5	5	5	200	428	501	500
24	5	5	5	5	5	5	5	5	199	291	500	500
25	5	5	5	5	5	5	5	5	201	223	500	500
26	5	5	5	5	5	5	5	10	201	278	500	499
27	5	5	5	5	5	5	5	10	198	270	499	500
28	5	5	5	5	5	5	5	10	202	223	500	500
29	5	5	5	5	.....	5	5	10	200	222	501	499
30	5	5	5	5	.....	5	5	10	200	200	500	502
31	5	.....	5	5	.....	5	.....	10	.....	175	501	.....

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Monthly discharge of Sandy River below Sandy Lake reservoir, Minn., for the year ending Sept. 30, 1913.

Month.	Discharge in second-feet.			Run-off (total in millions of cubic feet).
	Maximum.	Minimum.	Mean.	
October	5	0	4.7	12.6
November	5	5	5	13.0
December	5	5	5	13.4
January	5	5	5	13.4
February	5	5	5	12.1
March	5	5	5	13.4
April	5	5	5	13.0
May	10	5	6.0	16.1
June	350	10	142	368
July	476	52	190	509
August	503	78	475	1,270
September	502	499	500	1,300
The year	503	0	113	3,550

NOTE.—Computed by engineers of the United States Geological Survey from record of daily discharge furnished by the United States Engineer Corps.

PINE RIVER BELOW PINE RIVER RESERVOIR, MINN.

Location.—In T. 137 N., R. 27 W., just below dam at outlet of Cross Lake, which is 15 miles above the mouth of Pine River in the central part of Crow Wing County.

Records available.—March, 1886, to September 30, 1913.

Drainage area.—452 square miles.

Area of reservoir surface above dam.—At low water 18 square miles; at high water 24 square miles. These areas, with a range of 16.15 feet, give a capacity of 7,732,900,000 cubic feet. The dam raises the water level in Cross, Pine, Daggett, Rush, Whitefish, Trout, and Hay lakes by varying amounts.

Discharge.—Determined from daily gage heights representing the head at the dam and from the various sized openings in the dam.

Cooperation.—Station maintained by United States Engineer Corps.

Pine River reservoir is the lowest in the present system of Government reservoirs on the headwaters of the Mississippi. Although the discharge at the dam represents the flow from the reservoir, it does not represent the entire flow of Pine River at its mouth, because between the two points the drainage area of the river is increased from 452 to 691 square miles by Little Pine River and one or two other minor tributaries.

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Daily discharge, in second-feet, of Pine River below Pine River Reservoir, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	145	80	59	57	a 63	a 68	73	57	50	216	63	66
2	144	a 77	59	58	63	68	73	57	50	216	a 64	66
3	144	75	58	59	63	68	73	a 58	50	216	64	66
4	143	71	58	a 59	64	69	74	58	50	216	64	66
5	a 143	68	58	59	64	69	a 74	58	50	a 216	64	66
6	142	65	57	59	64	69	75	59	49	215	64	a 67
7	141	60	a 57	60	65	70	75	59	a 49	214	64	66
8	141	55	57	60	a 65	a 70	56	59	49	212	64	65
9	140	a 51	57	60	65	71	56	60	50	109	a 64	54
10	140	51	57	61	65	71	55	a 60	52	108	64	55
11	139	51	57	a 61	65	72	55	60	310	107	64	56
12	a 138	51	57	61	65	72	a 55	61	310	a 106	64	57
13	135	51	58	61	65	73	56	a 62	308	104	64	a 58
14	130	52	a 58	61	65	74	57	62	a 193	100	65	58
15	57	52	58	62	a 65	a 75	58	63	195	65	65	58
16	58	a 52	59	62	65	74	59	63	200	64	a 65	59
17	59	53	59	63	65	74	354	a 64	204	63	65	110
18	60	53	59	a 63	65	73	356	64	206	62	65	115
19	a 59	54	60	63	66	73	a 358	65	210	a 61	65	120
20	59	55	60	64	66	72	346	65	215	61	65	a 124
21	30	55	a 61	64	66	71	53	66	a 219	61	66	124
22	21	56	61	64	a 66	a 69	54	67	219	61	66	124
23	12	a 57	60	65	66	69	54	67	218	62	a 66	124
24	15	57	59	65	66	70	55	a 68	218	62	66	124
25	16	57	58	a 65	66	70	56	65	217	62	66	125
26	17	58	57	65	66	71	a 56	60	217	a 62	66	125
27	78	58	56	66	66	71	56	58	216	62	66	a 125
28	80	58	a 55	66	66	72	57	56	a 215	62	66	125
29	a 81	59	56	65	.....	a 72	57	54	215	62	66	125
30	81	a 59	56	65	.....	72	58	52	216	63	a 66	125
31	82	.....	57	66	.....	73	.....	a 50	.....	63	66	.....

a Discharge measurement.

NOTE.—Daily discharge for November differs from that published in the report of the water-resources investigation of Minnesota, 1911-12, p. 122, which is erroneous, having been estimated from record of gate openings, whereas the figures here given are based on discharge measurements.

Monthly discharge of Pine River below Pine River Reservoir, Minn., for the year ending Sept. 30, 1913.

[Drainage area, 452a square miles.]

Month.	Discharge in second-feet.			Run-off (total in millions of cubic-feet).
	Maximum.	Minimum.	Mean.	
October	145	12	91.3	245
November	80	51	b 58.4	151
December	61	55	58.0	155
January	66	57	62.2	167
February	66	63	65.0	157
March	75	68	71.1	190
April	358	53	99.8	259
May	68	50	60.5	162
June	310	49	167	433
July	216	61	110	295
August	66	63	64.9	174
September	125	54	89.9	233
The year	358	12	83.1	2,620

a "Discharge in second-feet per square mile" and "Run-off (depth in inches)" not computed for this drainage area because flow past the gaging station is controlled in the interest of navigation, as noted in the station description.

b See footnote to table of daily discharge.

NOTE.—Computed by engineers of the United States Geological Survey from record of daily discharge furnished by the United States Engineer Corps.

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CROW WING RIVER AT NIMROD, MINN.

Location.—In sec. 32, T. 137 N., R. 33 W., at steel highway bridge at Nimrod post office, 1 mile above mouth of Cat River, 1 mile below mouth of Willow Creek and about 12 miles east of Sebeka, the nearest railroad point.

Records available.—April 15, 1910, to September 30, 1913.

Drainage area.—1,010 square miles.

Gage.—Chain gage attached to the bridge; read morning and evening to quarter-tenths. Limits of use: Hundreds below 5.0, half-tenths from 5.0 to 6.0, and tenths above 6.0 feet.

Channel and control.—No well-defined control; channel practically permanent during period covered by records.

Discharge measurements.—Made from bridge.

Winter flow.—Affected by ice; observations discontinued when river is frozen.

Regulation.—Dam at outlet of Lower Crow Wing Lake controls water from that part of drainage area. River used for logging but since establishment of station flow has not been affected by log jams. River has considerable fall near station, and 1 mile above makes a descent of 12 feet, known as Western Rapids.

Accuracy.—See footnote to daily discharge table.

The following discharge measurement was made by S. B. Soule:

May 27, 1913: Gage height, 4.86 feet; discharge, 378 second-feet.

Daily gage height, in feet, of Crow Wing River at Nimrod, Minn., for the year ending Sept. 30, 1913.

[W. H. Wintermute, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	5.0	4.80	.....	.....	.....	.....	.....	4.68	4.80	4.92	5.2	5.2
2	5.0	4.80	.....	.....	.....	.....	.....	4.68	4.80	4.92	5.2	5.2
3	5.0	4.80	.....	.....	.....	.....	.....	4.70	4.78	4.92	5.2	5.2
4	5.0	4.80	.....	.....	.....	.....	.....	4.69	4.75	4.96	5.2	5.4
5	5.0	4.80	.....	.....	.....	.....	.....	4.68	4.78	5.15	5.2	5.5
6	5.0	4.80	.....	.....	.....	.....	.....	4.68	4.78	5.15	5.2	5.5
7	5.0	4.80	.....	.....	.....	.....	.....	4.68	4.78	5.2	5.2	5.5
8	5.0	4.80	.....	.....	.....	.....	6.2	4.68	4.75	5.2	5.15	5.45
9	5.0	4.80	.....	.....	.....	.....	6.2	4.68	4.75	5.25	5.15	5.45
10	4.98	4.80	.....	.....	.....	.....	6.0	4.65	4.72	5.2	5.1	5.5
11	4.95	4.80	.....	.....	.....	.....	6.0	4.65	4.72	5.4	5.1	5.5
12	4.98	4.80	.....	.....	.....	.....	5.3	4.65	4.70	5.45	5.1	5.5
13	4.98	4.82	.....	.....	.....	.....	4.89	4.65	4.70	5.4	5.1	5.5
14	4.95	4.85	.....	.....	.....	.....	4.80	4.65	4.70	5.45	5.1	5.45
15	4.95	4.89	.....	.....	.....	.....	4.76	4.69	4.70	5.55	5.1	5.45
16	4.92	4.86	.....	.....	.....	.....	4.75	4.85	4.70	5.65	5.1	5.4
17	4.90	4.82	.....	.....	.....	.....	4.72	4.85	4.70	5.65	5.15	5.4
18	4.88	4.80	.....	.....	.....	.....	4.70	4.85	4.70	5.6	5.25	5.4
19	4.88	4.80	.....	.....	.....	.....	4.70	4.86	4.78	5.55	5.3	5.4
20	4.88	4.78	.....	.....	.....	.....	4.70	4.94	4.78	5.55	5.3	5.35
21	4.88	4.78	.....	.....	.....	.....	4.68	4.95	4.75	5.5	5.3	5.3
22	4.88	4.75	.....	.....	.....	.....	4.68	4.92	4.70	5.55	5.3	5.3
23	4.85	4.75	.....	.....	.....	.....	4.68	4.92	4.70	5.5	5.25	5.3
24	4.85	4.90	.....	.....	.....	.....	4.70	4.90	4.70	5.5	5.25	5.3
25	4.85	5.4	.....	.....	.....	.....	4.70	4.90	4.70	5.5	5.2	5.25
26	4.85	5.05	.....	.....	.....	.....	4.69	4.90	4.88	5.45	5.2	5.25
27	4.82	5.1	.....	.....	.....	.....	4.68	4.88	4.90	5.3	5.2	5.2
28	4.82	5.1	.....	.....	.....	.....	4.68	4.82	4.88	5.2	5.2	5.2
29	4.80	5.1	.....	.....	.....	.....	4.68	4.80	4.85	5.2	5.2	5.2
30	4.80	5.2	.....	.....	.....	.....	4.68	4.80	4.92	5.2	5.2	5.2
31	4.80	5.4	.....	.....	.....	.....	.....	4.80	.....	5.2	5.2	.....

NOTE.—Discharge relation affected by ice about Nov. 24, 1912, to Apr. 11, 1913.

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Daily discharge, in second-feet, of Crow Wing River at Nimrod, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	457	324	.....	.....	.....	.....	.....	253	324	402	604	604
2	457	324	.....	.....	.....	.....	.....	253	324	402	604	604
3	457	324	.....	.....	.....	.....	.....	264	312	402	604	604
4	457	324	.....	.....	.....	.....	.....	258	294	429	604	758
5	457	324	.....	.....	.....	.....	.....	253	312	567	604	838
6	457	324	.....	.....	.....	.....	.....	253	312	567	604	838
7	457	324	.....	.....	.....	.....	.....	253	312	604	604	838
8	457	324	.....	.....	.....	.....	.....	253	294	604	567	798
9	457	324	.....	.....	.....	.....	.....	253	294	641	567	798
10	443	324	.....	.....	.....	.....	.....	236	276	604	530	838
11	422	324	.....	.....	.....	.....	.....	236	276	758	530	838
12	443	324	.....	.....	.....	.....	678	236	264	798	530	838
13	443	337	.....	.....	.....	.....	382	236	264	758	530	838
14	422	356	.....	.....	.....	.....	324	236	264	798	530	798
15	422	382	.....	.....	.....	.....	300	258	264	880	530	798
16	402	362	.....	.....	.....	.....	294	356	264	966	530	758
17	388	337	.....	.....	.....	.....	276	356	264	966	567	758
18	375	324	.....	.....	.....	.....	264	356	264	923	641	758
19	375	324	.....	.....	.....	.....	264	362	312	880	678	758
20	375	312	.....	.....	.....	.....	264	416	312	880	678	718
21	375	312	.....	.....	.....	.....	253	422	294	838	678	678
22	375	294	.....	.....	.....	.....	253	402	264	880	678	678
23	356	294	.....	.....	.....	.....	253	402	264	838	641	678
24	356	.....	.....	.....	.....	.....	264	388	264	838	641	678
25	356	.....	.....	.....	.....	.....	264	388	264	838	604	641
26	356	.....	.....	.....	.....	.....	258	388	375	798	604	641
27	337	.....	.....	.....	.....	.....	253	375	388	678	604	604
28	337	.....	.....	.....	.....	.....	253	337	375	604	604	604
29	324	.....	.....	.....	.....	.....	253	324	356	604	604	604
30	324	.....	.....	.....	.....	.....	253	324	402	604	604	604
31	324	.....	.....	.....	.....	.....	.....	324	.....	604	604	.....

NOTE.—Daily discharge computed from a rating curve fairly well defined between 160 and 678 second-feet (gage heights 4.5 and 5.3 feet). Estimates above 678 second-feet based on an extension of the discharge rating curve and should therefore be used with caution. Discharge Nov. 24–30, 1912, estimated, because of ice, from climatic records and discharge of adjacent drainage areas, at 294 second-feet.

Monthly discharge of Crow Wing River at Nimrod, Minn., for the year ending Sept. 30, 1913.

[Drainage area, 1,010 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	457	324	401	0.397	0.46	A.
November	382	.....	319	.316	.35	C.
April 12–30	678	253	295	.292	.21	C.
May	422	236	311	.308	.36	A.
June	402	264	302	.299	.33	A.
July	966	402	708	.701	.81	A.
August	678	530	597	.591	.68	A.
September	838	604	726	.719	.80	A.

CROW WING RIVER AT MOTLEY, MINN.

Location.—At highway bridge at north edge of village of Motley, about one-fourth mile north of Northern Pacific Railway station and about 2 miles above mouth of Prairie River, the nearest tributary.

Records available.—June 10 to November 30, 1909; April 15 to September 30, 1913.

Drainage area.—2,140 square miles.

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Gage.—Vertical staff gage; read morning and evening to hundredths. Limits of use: Hundredths below 6.0, half-tenths from 6.0 to 7.5, and tenths above 7.5 feet.

Channel and control.—Fairly permanent.

Discharge measurements.—Made from upstream side of two-span highway bridge.

Winter flow.—River frozen over during the winter months; observations discontinued.

Regulation.—Nearest dam above station is over 60 miles upstream and has very slight effect on flow at station.

Accuracy.—Backwater from possible log jams at certain periods may affect the discharge relation.

Discharge measurements of Crow Wing River at Motley, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 15	S. B. Soulé	6.35	723
May 26	do	6.77	1,120

Daily gage height, in feet, of Crow Wing River at Motley, Minn., for the year ending Sept. 30, 1913.

[S. W. Jacobs, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	6.25	6.45	6.3	6.45	6.3	16	.....	6.8	6.05	7.2	6.3	6.75
2	.....	6.25	6.4	6.25	6.35	6.25	17	6.25	6.9	6.0	7.25	6.3	6.7
3	.....	6.3	6.35	6.2	6.35	6.2	18	6.25	6.9	6.0	7.3	6.3	6.65
4	.....	6.35	6.3	6.25	6.3	6.5	19	6.2	6.85	6.05	7.2	6.45	6.65
5	.....	6.4	6.3	6.7	6.3	6.8	20	6.2	6.8	6.1	7.1	6.6	6.6
6	.....	6.35	6.3	6.9	6.25	6.85	21	6.2	6.85	6.15	7.0	6.65	6.6
7	.....	6.3	6.25	6.95	6.2	6.85	22	6.25	6.9	6.1	7.0	6.65	6.6
8	.....	6.3	6.25	7.0	6.2	6.85	23	6.25	6.9	6.05	7.0	6.65	6.5
9	.....	6.3	6.2	7.05	6.2	6.75	24	6.35	6.9	6.05	6.85	6.65	6.55
10	.....	6.25	6.2	6.95	6.2	6.75	25	6.4	6.85	6.1	6.8	6.45	6.55
11	.....	6.25	6.15	6.95	6.2	6.85	26	6.4	6.75	6.2	6.75	6.5	6.5
12	.....	6.3	6.1	7.05	6.2	6.9	27	6.4	6.7	6.2	6.75	6.45	6.5
13	.....	6.3	6.1	7.15	6.3	6.9	28	6.35	6.6	6.2	6.65	6.4	6.45
14	.....	6.3	6.05	7.15	6.2	6.85	29	6.3	6.55	6.15	6.55	6.35	6.45
15	.....	6.5	6.05	7.15	6.2	6.8	30	6.25	6.45	6.3	6.5	6.3	6.45
							31	.....	6.45	.....	6.5	6.3	.....

Daily discharge, in second-feet, of Crow Wing River, at Motley, Minn., for the year ending Sept. 30, 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	650	784	680	784	680	16	.....	1,110	550	1,660	680	1,060
2	.....	650	747	650	714	650	17	650	1,240	528	1,730	680	1,060
3	.....	680	714	621	714	621	18	650	1,240	528	1,810	680	955
4	.....	714	680	650	680	822	19	621	1,170	550	1,660	784	955
5	.....	747	680	1,000	680	1,110	20	621	1,110	571	1,510	907	907
6	.....	714	680	1,240	650	1,170	21	621	1,170	596	1,360	955	907
7	.....	680	650	1,300	621	1,170	22	650	1,240	571	1,360	955	907
8	.....	680	650	1,360	621	1,170	23	650	1,240	550	1,360	955	822
9	.....	680	621	1,440	621	1,060	24	714	1,240	560	1,170	955	864
10	.....	650	621	1,300	621	1,060	25	747	1,170	571	1,110	784	864
11	.....	650	596	1,300	621	1,170	26	747	1,060	621	1,060	822	822
12	.....	680	571	1,440	621	1,240	27	747	1,000	621	1,060	784	822
13	.....	680	571	1,580	680	1,240	28	714	907	621	955	747	784
14	.....	680	550	1,580	621	1,170	29	680	864	596	864	714	784
15	.....	822	550	1,580	621	1,110	30	650	784	680	822	680	784
							31	.....	784	.....	822	680	.....

NOTE.—Daily discharge computed from a rating curve well-defined above 621 second-feet (gage-height 6.3 feet.

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Monthly discharge of Crow Wing River at Motley, Minn., for the year ending Sept. 30, 1915.

[Drainage area, 2,140 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
April 17–30	747	621	676	0.316	0.16	B.
May	1,240	650	893	.417	.48	A.
June	784	528	612	.286	.32	B.
July	1,810	621	1,230	.575	.66	B.
August	955	621	730	.341	.39	A.
September	1,240	621	956	.447	.50	A.

CROW WING RIVER AT PILLAGER, MINN.

Location.—In sec. 20, T. 133 N., R. 30 W., at highway bridge half a mile south of Pillager, a short distance above mouth of Pillager Creek.

Records available.—May 25 to September 1, 1903; June 11, 1909, to June 30, 1913, when station was discontinued.

Drainage area.—3,230 square miles.

Gage.—Vertical staff; read morning and evening to quarter-tenths. Limits of use: Hundredths below 5.0, half-tenths from 5.0 to 6.5, and tenths above 6.5 feet.

Channel and control.—Probably permanent except during high water.

Discharge measurements.—Made from bridge.

Winter flow.—Determined by measurements made through the ice.

Regulation.—The influence of a logging dam at the outlet of Lower Crow Wing Lake is observable at times at the gaging station.

Accuracy.—Conditions at this station were favorable for good results, but the construction of a power dam 10 miles below caused backwater at the gage and the station had to be abandoned.

Discharge measurements of Crow Wing River at Pillager, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 18	S. B. Soulé	6.14	[a] 4.40	Feb. 19	S. B. Soulé	6.47	[a] 344
Jan. 17	do	6.22	[a] 358	Apr. 15	do	6.12	970

[a] Complete ice cover.

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Daily gage height, in feet, of Crow Wing River at Pillager, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	6.1	5.7	.....	.....	.....	.....	7.0	6.1	6.3	.....	.....	.....
2	6.1	5.6	.....	.....	.....	.....	7.0	6.25	6.25	.....	.....	.....
3	6.1	5.6	.....	6.3	.....	.....	7.3	6.25	6.2	.....	.....	.....
4	6.0	5.65	.....	.....	.....	.....	7.3	6.35	6.2	.....	.....	.....
5	5.95	5.7	5.8	.....	.....	.....	7.5	6.3	6.0	.....	.....	.....
6	5.95	5.7	.....	.....	6.35	6.6	.....	6.4	6.0	.....	.....	.....
7	5.9	5.7	.....	.....	.....	.....	.....	6.45	5.95	.....	.....	.....
8	5.9	5.7	.....	.....	.....	.....	.....	6.4	5.85	.....	.....	.....
9	5.9	5.7	.....	6.2	.....	.....	.....	6.4	5.75	.....	.....	.....
10	5.9	5.7	.....	.....	.....	.....	.....	6.3	5.65	.....	.....	.....
11	5.9	5.7	.....	.....	.....	.....	.....	6.3	5.6	.....	.....	.....
12	5.9	5.7	5.9	.....	.....	.....	6.8	6.35	5.7	.....	.....	.....
13	5.9	5.7	.....	.....	6.4	6.6	7.0	6.4	5.65	.....	.....	.....
14	5.85	5.65	.....	.....	.....	.....	6.3	6.45	5.85	.....	.....	.....
15	5.8	5.6	.....	.....	.....	.....	6.25	6.6	5.8	.....	.....	.....
16	5.8	5.75	.....	6.2	.....	.....	6.25	7.1	5.75	.....	.....	.....
17	5.8	5.7	.....	6.2	.....	.....	6.45	7.5	5.8	.....	.....	.....
18	5.8	5.65	6.15	.....	.....	.....	6.4	7.4	5.7	.....	.....	.....
19	5.8	5.6	6.15	.....	6.5	.....	6.45	7.4	5.85	.....	.....	.....
20	5.75	5.6	.....	.....	6.5	6.6	6.35	7.4	5.8	.....	.....	.....
21	5.75	5.65	.....	.....	.....	.....	6.35	7.4	5.85	.....	.....	.....
22	5.75	5.65	.....	.....	.....	.....	6.35	7.5	5.85	.....	.....	.....
23	5.75	5.6	.....	6.2	.....	.....	6.25	7.4	5.85	.....	.....	.....
24	5.75	5.5	.....	.....	.....	.....	6.35	7.4	5.95	.....	.....	.....
25	5.75	5.55	.....	.....	.....	.....	6.5	7.3	5.9	.....	.....	.....
26	5.75	6.25	6.2	.....	.....	.....	6.6	7.2	6.0	.....	.....	.....
27	5.7	.....	.....	.....	6.5	6.6	6.6	7.2	6.2	.....	.....	.....
28	5.75	.....	.....	.....	.....	.....	6.5	7.0	6.2	.....	.....	.....
29	5.75	.....	.....	.....	.....	.....	6.35	6.8	6.25	.....	.....	.....
30	5.75	.....	.....	6.3	.....	.....	6.2	6.6	6.2	.....	.....	.....
31	5.75	.....	.....	.....	.....	.....	.....	6.45	.....	.....	.....	.....

NOTE.—Discharge relation affected by ice about Nov. 26, 1912, to Apr. 14, 1913.

Daily discharge, in second-feet, of Crow Wing River at Pillager, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	865	601	.....	.....	.....	.....	.....	965	1,120	.....	.....	.....
2	865	544	.....	.....	.....	.....	.....	1,080	1,080	.....	.....	.....
3	865	544	.....	.....	.....	.....	.....	1,080	1,040	.....	.....	.....
4	793	572	.....	.....	.....	.....	.....	1,160	1,040	.....	.....	.....
5	759	601	.....	.....	.....	.....	.....	1,120	890	.....	.....	.....
6	759	601	.....	.....	.....	.....	.....	1,200	890	.....	.....	.....
7	725	601	.....	.....	.....	.....	.....	1,240	855	.....	.....	.....
8	725	601	.....	.....	.....	.....	.....	1,200	785	.....	.....	.....
9	725	601	.....	.....	.....	.....	.....	1,200	718	.....	.....	.....
10	725	601	.....	.....	.....	.....	.....	1,120	655	.....	.....	.....
11	725	601	.....	.....	.....	.....	.....	1,120	625	.....	.....	.....
12	725	601	.....	.....	.....	.....	.....	1,160	685	.....	.....	.....
13	725	601	.....	.....	.....	.....	.....	1,200	655	.....	.....	.....
14	693	572	.....	.....	.....	.....	.....	1,240	785	.....	.....	.....
15	661	544	.....	.....	.....	.....	1,080	1,370	750	.....	.....	.....
16	661	631	.....	.....	.....	.....	1,080	1,840	718	.....	.....	.....
17	661	601	.....	.....	.....	.....	1,240	2,260	750	.....	.....	.....
18	661	572	.....	.....	.....	.....	1,200	2,150	685	.....	.....	.....
19	661	544	.....	.....	.....	.....	1,240	2,150	785	.....	.....	.....
20	631	544	.....	.....	.....	.....	1,160	2,150	750	.....	.....	.....
21	631	572	.....	.....	.....	.....	1,160	2,150	785	.....	.....	.....
22	631	572	.....	.....	.....	.....	1,160	2,260	785	.....	.....	.....
23	631	544	.....	.....	.....	.....	1,080	2,150	785	.....	.....	.....
24	631	490	.....	.....	.....	.....	1,160	2,150	855	.....	.....	.....
25	631	517	.....	.....	.....	.....	1,280	2,040	820	.....	.....	.....
26	631	.....	.....	.....	.....	.....	1,370	1,940	890	.....	.....	.....
27	601	.....	.....	.....	.....	.....	1,370	1,940	1,040	.....	.....	.....
28	631	.....	.....	.....	.....	.....	1,280	1,740	1,040	.....	.....	.....
29	631	.....	.....	.....	.....	.....	1,160	1,550	1,080	.....	.....	.....
30	631	.....	.....	.....	.....	.....	1,040	1,370	1,040	.....	.....	.....
31	631	.....	.....	.....	.....	.....	.....	1,240	.....	.....	.....	.....

NOTE.—Daily discharge computed from two rating curves fairly well defined between 600 and 5,500 second-feet. Shift occurred during flood in April, 1913. Discharge estimated, because of ice, from gage heights, observer's notes, discharge measurements, and climatic records, as follows: Nov. 26–30, 465 second-feet; Dec. 1–18, 470 second-feet; Dec. 19–31, 1912, 420 second-feet; Jan. 1–31, 1913, 375 second-feet; Feb. 1–28, 345 second-feet; Mar. 1–31, 410 second-feet; and Apr. 1–14, 600 second-feet.

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Monthly discharge of Crow Wing River at Pillager, Minn., for the year ending Sept. 30, 1913.

[Drainage area, 3,230 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	865	601	694	0.215	0.25	B.
November	631	.....	557	.172	.19	C.
December	.....	.....	450	.139	.16	C.
January	.....	.....	375	.116	.13	C.
February	.....	.....	345	.107	.11	C.
March	.....	.....	410	.127	.15	C.
April	.....	.....	915	.283	.32	C.
May	2,260	965	1,570	.486	.56	B.
June	1,120	625	846	.262	.29	B.

LONG PRAIRIE RIVER NEAR MOTLEY, MINN.

Location.—In sec. 19, T. 133 N., R. 31 W., 100 yards above highway bridge, 1 mile south of Motley, and 2 miles above mouth of river.

Records available.—June 10, 1909, to September 30, 1913.

Drainage area.—973 square miles.

Gage.—Vertical staff; read morning and evening, generally to nearest tenth; occasional readings to half-tenths. Limits of use: Hundredths below 5.5, half tenths from 5.5 to 6.5, and tenths above 6.5 feet.

Channel and control.—Light gravel; practically permanent.

Discharge measurements.—Made from bridge at all except low stages; low-water measurements made by wading a short distance upstream.

Winter flow.—River frozen over at gage; observations discontinued. There seems to be a close comparison between the open-water discharge at this station and the flow of the Crow Wing at Pillager, and therefore the winter flow has been based on the flow at Pillager, which is determined by current-meter measurements.

Accuracy.—Conditions at this station are favorable and the records should be reliable. Backwater caused by ice gorges in Crow Wing River may possibly affect the discharge relation for a few days in the spring.

The following discharge measurement was made by S. B. Soulé:

April 14, 1913: Gage height, 5.56 feet; discharge, 271 second-feet.

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Daily gage height, in feet, of Long Prairie River near Motley, Minn., for the year ending Sept. 30, 1913.

[Clem Thompson, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	5.32	5.19	.....	.....	.....	.....	.....	5.3	5.5	5.05	5.3	5.2
2	5.32	5.12	.....	.....	.....	.....	.....	5.5	5.4	5.15	5.2	5.2
3	5.31	5.15	.....	.....	.....	.....	.....	5.5	5.5	5.12	5.25	5.3
4	5.30	5.15	.....	.....	.....	.....	.....	5.5	5.45	5.3	5.15	5.5
5	5.26	5.12	.....	.....	.....	.....	.....	5.45	5.3	5.25	5.25	5.2
6	5.29	5.18	.....	.....	.....	.....	.....	5.5	5.35	5.35	5.15	5.3
7	5.25	5.18	.....	.....	.....	.....	.....	5.5	5.2	5.4	5.2	5.2
8	5.25	5.16	.....	.....	.....	.....	.....	5.5	5.3	5.4	5.1	5.2
9	5.24	5.16	.....	.....	.....	.....	.....	5.5	5.2	5.3	5.2	5.2
10	5.25	5.16	.....	.....	.....	.....	.....	5.5	5.3	5.3	5.1	5.35
11	5.26	5.15	.....	.....	.....	.....	.....	5.3	5.3	5.3	5.2	5.2
12	5.29	5.16	.....	.....	.....	.....	.....	5.4	5.2	5.5	5.1	5.3
13	5.29	5.11	.....	.....	.....	.....	.....	5.4	5.3	5.5	5.2	5.4
14	5.29	5.08	.....	.....	.....	.....	5.5	5.4	5.3	5.6	5.2	5.3
15	5.28	5.11	.....	.....	.....	.....	5.4	5.5	5.1	5.6	5.34	5.4
16	5.25	5.14	.....	.....	.....	.....	5.4	5.8	5.2	5.62	5.3	5.2
17	5.25	5.20	.....	.....	.....	.....	5.4	5.9	5.2	5.5	5.4	5.3
18	5.26	5.14	.....	.....	.....	.....	5.35	5.9	5.2	5.6	5.3	5.1
19	5.22	5.14	.....	.....	.....	.....	5.4	5.9	5.1	5.4	5.4	5.2
20	5.22	5.12	.....	.....	.....	.....	5.35	5.9	5.2	5.5	5.5	5.1
21	5.22	5.12	.....	.....	.....	.....	5.35	5.8	5.1	5.4	5.7	5.1
22	5.21	5.15	.....	.....	.....	.....	5.35	5.95	5.0	5.5	5.5	5.2
23	5.20	5.11	.....	.....	.....	.....	5.35	6.0	5.1	5.4	5.5	5.1
24	5.20	.....	.....	.....	.....	.....	5.5	6.0	5.1	5.4	5.4	5.3
25	5.20	.....	.....	.....	.....	.....	5.6	5.9	5.1	5.4	5.5	5.2
26	5.19	.....	.....	.....	.....	.....	5.6	5.9	5.3	5.5	5.38	5.2
27	5.19	.....	.....	.....	.....	.....	5.6	5.85	5.3	5.4	5.48	5.1
28	5.21	.....	.....	.....	.....	.....	5.6	5.7	5.25	5.4	5.35	5.2
29	5.22	.....	.....	.....	.....	.....	5.5	5.7	5.1	5.3	5.38	5.1
30	5.20	.....	.....	.....	.....	.....	5.4	5.6	5.25	5.35	5.25	5.2
31	5.20	.....	.....	.....	.....	.....	.....	5.45	.....	5.3	5.35	.....

NOTE.—Discharge relation affected by ice about Nov. 24, 1912, to Apr. 13, 1913.

Daily discharge, in second-feet, of Long Prairie River near Motley, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	185	145	.....	.....	.....	.....	.....	178	250	110	178	148
2	185	127	.....	.....	.....	.....	.....	250	212	135	148	148
3	181	135	.....	.....	.....	.....	.....	250	250	127	163	178
4	178	135	.....	.....	.....	.....	.....	250	231	178	135	250
5	166	127	.....	.....	.....	.....	.....	231	178	163	163	148
6	175	143	.....	.....	.....	.....	.....	250	195	195	135	178
7	163	143	.....	.....	.....	.....	.....	250	178	212	148	148
8	163	138	.....	.....	.....	.....	.....	250	178	212	122	178
9	160	138	.....	.....	.....	.....	.....	250	148	178	148	148
10	163	138	.....	.....	.....	.....	.....	250	178	178	122	195
11	166	135	.....	.....	.....	.....	.....	178	178	178	148	178
12	175	138	.....	.....	.....	.....	.....	212	148	250	122	178
13	175	125	.....	.....	.....	.....	.....	212	178	250	148	212
14	175	117	.....	.....	.....	.....	250	212	178	290	148	178
15	172	125	.....	.....	.....	.....	212	250	122	290	192	212
16	163	132	.....	.....	.....	.....	212	380	148	290	178	148
17	163	148	.....	.....	.....	.....	212	430	148	250	212	178
18	166	132	.....	.....	.....	.....	195	430	148	290	178	122
19	154	132	.....	.....	.....	.....	212	430	122	212	212	148
20	154	127	.....	.....	.....	.....	195	430	148	250	250	122
21	154	127	.....	.....	.....	.....	195	380	122	212	333	122
22	151	135	.....	.....	.....	.....	195	455	99	250	250	148
23	148	125	.....	.....	.....	.....	195	480	122	212	250	122
24	148	.....	.....	.....	.....	.....	250	480	122	212	212	178
25	148	.....	.....	.....	.....	.....	290	430	122	212	250	148
26	145	.....	.....	.....	.....	.....	290	430	178	250	205	148
27	145	.....	.....	.....	.....	.....	290	405	178	212	242	122
28	151	.....	.....	.....	.....	.....	290	333	163	212	195	148
29	154	.....	.....	.....	.....	.....	250	333	122	178	205	122
30	148	.....	.....	.....	.....	.....	212	290	163	195	163	148
31	148	.....	.....	.....	.....	.....	.....	231	.....	178	195	.....

NOTE.—Daily discharge computed from a rating curve well defined between 430 and 1,650 second-feet (gage heights, 4.9 and 8.0 feet).

Discharge estimated, because of ice, from climatic records, and open-water relation between flow of Crow Wing River at Pillager and Long Prairie River near Motley as follows: Nov. 24–30, 120 second-feet; Dec. 1–31, 1912, 100 second-feet; Jan. 1–31, 1913, 95 second-feet; Feb. 1–28, 90 second-feet, Mar. 1–31, 110 second-feet; and Apr. 1–13, 160 second-feet.

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Monthly discharge of Long Prairie River near Motley, Minn., for the years ending Sept. 30, 1912–13.

[Drainage area, 973 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1911–12.						
October	361	125	184	0.189	0.22	A.
November 1–11	301	99	173	.178	.07	B.
December						
January			105	.108	.12	
February			100	.103	.11	
March			120	.123	.14	
April	805	172	299	.307	.34	B.
May	2,960	216	848	.872	1.01	A.
June	640	148	340	.349	.39	A.
July	250	135	171	.176	.20	A.
August	405	185	265	.272	.31	A.
September	270	185	211	.217	.24	A.
1912–13.						
October	185	145	162	.166	.19	A.
November	148		130	.134	.15	B.
December			100	.103	.12	
January			95	.098	.11	D.
February			90	.092	.10	D.
March			110	.113	.13	D.
April	290		201	.207	.23	C.
May	480	178	317	.326	.38	A.
June	250	99	164	.169	.19	A.
July	299	110	212	.218	.25	A.
August	333	122	185	.190	.22	A.
September	250	122	160	.164	.18	A.
The year	480		161	.165	2.25	

NOTE.—Estimates of "Discharge in second-feet per square mile" and "Run-off (depth in inches)" for 1912, supersede those published in Water-Supply Paper 325, which were computed from an erroneous value of the drainage area. Estimates for October, November, and December, 1911, are republished to complete the data for the climatic year.

SAUK RIVER NEAR ST. CLOUD, MINN.

Location.—In sec. 9, T. 124 N., R. 28 W., at highway bridge 3 miles west of St. Cloud 10 miles below the nearest tributary, which enters at Rockville.

Records available.—July 8, 1909, to December 31, 1913.

Drainage area.—816 square miles.

Gage.—Chain gage attached to bridge; read twice daily to quarter-tenths. Limits of use: Hundredths below 6.5, half-tenths from 6.5 to 8.0, and tenths above 8.0 feet.

Channel and control.—No well-defined control; channel shifts somewhat during high water.

Discharge measurements.—Made from bridge; at low stages by wading just a few feet above the bridge section.

Winter flow.—Affected by ice; observations discontinued.

Regulation.—Farmers Milling Co. have an 8-foot masonry dam at Cold Spring, about 15 miles above gaging station. During the fall the plants operate continuously; at other times about 10 hours a day. Fluctuations of stage is caused by operation of dam.

Accuracy.—On account of growth of vegetation and shifting channel, records only fair.

Discharge measurements of Sauk River near St. Cloud, Minn., from Oct. 1, 1912, to Dec. 31, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
1912.		*Feet.*	*Sec.-ft.*	1913.		*Feet.*	*Sec.-ft.*
Oct. 15	W. G. Hoyt	6.16	165	Apr. 9	S. B. Soulé	6.90	[a]58.4
15	.....do	6.13	156	May 19	S. B. Soulé	5.99	148
Nov. 20	.....do	5.97	116	Sept. 5	W. G. Hoyt	6.38	[b]194
				Oct. 22	.....do	6.05	154

[a] Complete ice cover.

[b] Weeds and grass in channel.

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Daily gage height, in feet, of Sauk River near St. Cloud, Minn., Oct. 1, 1912, to Dec. 31, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6.35	.....	.....	.....	.....	.....	.....	6.42	6.36	5.60	6.9	6.7	6.10	6.16	5.92
2	6.30	.....	.....	.....	.....	.....	.....	6.31	6.25	5.94	6.8	6.8	6.11	5.91	6.42
3	6.35	.....	.....	.....	.....	.....	.....	6.44	6.41	6.12	6.7	6.9	6.14	5.91	6.41
4	6.30	.....	.....	.....	.....	.....	.....	6.24	6.41	6.26	6.6	6.75	6.21	6.36	6.38
5	6.30	.....	.....	.....	.....	.....	.....	6.19	6.41	6.01	6.7	6.6	6.15	6.35	6.10
6	6.40	.....	.....	.....	.....	.....	.....	6.19	6.24	6.11	6.6	6.6	5.84	6.34	6.05
7	6.35	6.00	.....	.....	.....	.....	.....	6.46	5.99	5.62	6.55	6.39	6.12	6.36	6.28
8	6.25	6.05	.....	.....	.....	.....	.....	6.44	5.80	6.14	6.65	6.38	6.12	6.35	6.53
9	6.20	5.95	.....	.....	.....	.....	6.9	6.40	5.60	6.34	6.6	6.42	6.16	6.32	6.45
10	6.05	5.85	.....	.....	.....	.....	7.4	.....	5.35	6.40	6.6	6.48	6.24	6.10	6.75
11	6.10	5.40	.....	.....	.....	.....	7.25	.....	5.55	6.9	6.28	6.7	6.28	6.55	6.6
12	6.15	6.10	.....	.....	.....	.....	7.0	.....	5.72	7.05	6.48	6.55	6.29	6.35	6.65
13	5.30	5.85	.....	.....	.....	.....	6.8	.....	5.90	7.05	6.38	6.41	5.99	6.26	6.7
14	5.35	5.70	.....	.....	.....	.....	5.96	.....	5.90	6.7	6.35	6.36	6.28	6.24	6.32
15	.....	5.75	.....	.....	.....	.....	6.20	.....	5.98	7.2	6.28	5.98	6.30	6.25	5.95
16	.....	5.90	.....	.....	.....	.....	6.05	.....	5.36	8.3	6.24	6.30	6.32	6.10	6.5
17	.....	5.65	.....	.....	.....	.....	6.06	.....	5.82	7.7	6.35	6.32	6.32	6.06	6.65
18	.....	5.50	.....	.....	.....	.....	6.08	.....	5.89	7.6	6.12	6.25	6.30	6.00	6.65
19	.....	5.75	.....	.....	.....	.....	6.05	.....	5.91	7.5	6.45	6.21	6.19	6.18	6.7
20	.....	5.90	.....	.....	.....	.....	5.99	6.5	5.96	7.45	6.55	6.20	6.02	6.21	6.55
21	.....	6.05	.....	.....	.....	.....	5.88	6.65	5.91	7.4	6.55	6.05	6.00	6.21	6.65
22	.....	6.00	.....	.....	.....	.....	6.08	6.75	5.76	7.45	6.8	5.90	6.18	6.29	6.31
23	.....	6.15	.....	.....	.....	.....	6.19	6.8	5.52	7.5	6.9	.....	6.21	5.89	6.5
24	.....	6.56	.....	.....	.....	.....	6.30	6.8	5.60	7.4	7.3	.....	6.21	5.74	6.9
25	.....	5.50	.....	.....	.....	.....	6.35	7.0	5.52	7.2	7.3	6.05	6.20	5.81	6.5
26	.....	6.15	.....	.....	.....	.....	6.35	7.0	5.79	7.15	7.1	6.20	6.14	5.86	6.28
27	.....	6.6	.....	.....	.....	.....	6.31	6.7	5.96	7.15	7.05	6.20	5.92	6.04	6.19
28	.....	.....	.....	.....	.....	.....	6.40	6.65	5.91	6.9	7.0	6.19	6.18	5.90	6.16
29	.....	.....	.....	.....	.....	.....	6.55	6.5	5.89	7.0	6.95	6.00	6.19	6.40	5.95
30	.....	.....	.....	.....	.....	.....	6.55	6.55	5.74	7.0	6.9	6.10	6.08	6.28	6.06
31	.....	.....	.....	.....	.....	.....	.....	6.44	.....	6.8	6.9	.....	6.18	.....	6.08

NOTE.—Discharge relation affected by ice about Nov. 21, 1912, to Apr. 13, 1913, but probably not materially affected during November and December, 1913.

Daily discharge, in second-feet, of Sauk River near St. Cloud, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	231	.....	.....	.....	.....	.....	.....	256	238	34	404	316
2	215	.....	.....	.....	.....	.....	.....	223	206	90	358	358
3	231	.....	.....	.....	.....	.....	.....	263	253	129	316	404
4	215	.....	.....	.....	.....	.....	.....	203	253	166	277	337
5	215	.....	.....	.....	.....	.....	.....	189	253	104	316	277
6	248	.....	.....	.....	.....	.....	.....	189	203	126	277	277
7	231	120	.....	.....	.....	.....	.....	269	140	37	259	205
8	199	132	.....	.....	.....	.....	.....	263	99	134	296	202
9	183	109	.....	.....	.....	.....	.....	250	68	189	277	215
10	142	88	.....	.....	.....	.....	.....	.....	42	208	277	234
11	155	20	.....	.....	.....	.....	.....	.....	62	404	171	316
12	169	144	.....	.....	.....	.....	.....	.....	85	482	234	259
13	14	88	.....	.....	.....	.....	.....	.....	120	482	202	211
14	19	61	.....	.....	.....	.....	133	.....	120	316	192	196
15	.....	69	.....	.....	.....	.....	192	.....	138	565	171	98
16	.....	98	.....	.....	.....	.....	154	.....	38	1,320	160	177
17	.....	53	.....	.....	.....	.....	156	.....	94	885	192	153
18	.....	32	.....	.....	.....	.....	161	.....	107	815	129	163
19	.....	69	.....	.....	.....	.....	154	.....	112	750	224	152
20	.....	98	.....	.....	.....	.....	140	282	122	718	259	149
21	.....	.....	.....	.....	.....	.....	116	336	101	685	259	113
22	.....	.....	.....	.....	.....	.....	161	378	76	718	358	82
23	.....	.....	.....	.....	.....	.....	189	400	48	750	404	a 92
24	.....	.....	.....	.....	.....	.....	220	400	56	685	625	a 108
25	.....	.....	.....	.....	.....	.....	235	500	48	565	625	113
26	.....	.....	.....	.....	.....	.....	235	500	74	538	510	149
27	.....	.....	.....	.....	.....	.....	223	356	101	538	482	149
28	.....	.....	.....	.....	.....	.....	250	336	92	404	455	146
29	.....	.....	.....	.....	.....	.....	300	282	89	455	430	102
30	.....	.....	.....	.....	.....	.....	300	300	67	455	404	124
31	.....	.....	.....	.....	.....	.....	.....	263	.....	358	404	.....

a Discharge interpolated.

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Daily discharge, in second-feet, of Sauk River near St. Cloud, Minn., for the period Oct. 1 to Dec. 31, 1913.

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day	Oct.	Nov.	Dec.
1	131	182	124	11	200	300	317	21	142	195	336
2	133	122	256	12	203	235	336	22	187	217	223
3	140	122	253	13	129	209	356	23	195	118	282
4	156	238	244	14	200	203	226	24	196	89	450
5	142	235	166	15	206	206	131	25	192	101	282
6	89	232	154	16	226	166	282	26	176	111	214
7	147	238	214	17	226	156	336	27	124	152	189
8	147	235	300	18	220	142	336	28	187	120	182
9	156	226	266	19	189	187	356	29	189	250	131
10	176	166	378	20	147	195	300	30	161	214	156
								31	187	.....	161

NOTE.—Daily discharge computed from two fairly well defined rating curves. Backwater from growth of grass in channel has been assumed to have occurred during last part of June.

For days on which gage was not read discharge was estimated as follows: Oct. 15–31, 1912, 150 second-feet, and Nov. 1–6, 125 second-feet, from the discharge measurements made Oct. 15 and Nov. 20, 1912, and a study of the records of flow at Rockford and Watson, Minn.; May 10–19, 1913, 300 second-feet, from a study of the records of Long Prairie River near Motley and Elk River near Big Lake. Discharge estimated, on account of ice, as follows: Nov. 21–30, 1912, 75 second-feet; Dec. 1–31, 1912, 80 second-feet (by comparison with the flow of Elk River near Big Lake).

Monthly discharge of Sauk River near St. Cloud, Minn., Oct. 1, 1912, to Dec. 31, 1913.

[Drainage area, 816 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1912–13.						
October	248	14	162	0.199	0.23	C.
November	.....	.....	89.4	.110	.12	C.
December	.....	.....	80	.098	.11	D.
April 14–30	300	116	195	.239	.15	B.
May	.....	.....	304	.373	.43	B.
June	253	38	117	.143	.16	C.
July	1,320	34	455	.558	.64	C.
August	625	129	321	.393	.45	C.
September	404	82	197	.241	.27	C.
1913.						
October	226	89	171	.210	.24	B.
November	300	89	185	.227	.25	B.
December	450	124	256	.314	.36	B.

ELK RIVER NEAR BIG LAKE, MINN.

Location.—In sec. 23, T. 33 N., R. 27 W., at the highway bridge 4 miles east of Big Lake and half a mile north of Bailey station on the Northern Pacific Railway, half a mile above Tibbetts Brook, and 4 miles below mouth of St. Francis River.

Records available.—April 15, 1911, to September 30, 1913.

Drainage area.—615 square miles.

Gage.—Vertical staff; read morning and evening to quarter-tenths. Limits of use: Hundredths below 1.0, half-tenths from 1.0 to 2.0, and tenths above 2.0 feet.

Channel and control.—Channel apt to shift during extremely high water; during low water practically permanent except at extremely low stages when possible backwater may result from growth of vegetation.

Discharge measurements.—Made from highway bridge; at low stages by wading.

Winter flow.—Determined by measurements made through the ice.

Regulation.—Flow above station not regulated; only dam on river is 8 miles below, near mouth.

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Discharge measurements of Elk River near Big Lake, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 21	S. B. Soulé	0.84	[a] 95	Feb. 25	S. B. Soulé	1.32	[a] 99
21	do	.84	[a] 94	Mar. 18	do	1.85	[b] 198
Jan. 28	do	1.24	[a] 55	Apr. 19	do	.85	182
28	do	1.24	[a] 57				

[a] Complete ice cover.
[b] About 40 per cent ice cover at control. Measurement made about 1,000 feet above gage.

Daily gage height, in feet, of Elk River near Big Lake, Minn., for the year ending Sept. 30, 1913.

[Michael Tracy, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	0.85	0.72	0.70	.....	.....	.....	1.4	0.96	1.1	0.45	1.4	1.0
2	.82	.72	.79	0.95	.....	.....	1.3	.95	1.0	.42	1.4	1.05
3	.82	.72	.79	.....	.....	.....	1.3	1.05	.95	.80	1.35	1.05
4	.81	.72	.79	.....	.....	.....	1.1	.99	.89	.88	1.3	1.2
5	.80	.71	.70	.....	.....	.....	1.1	.94	.82	.98	1.25	1.1
6	.79	.70	.50	.....	1.5	1.2	1.15	.89	.76	.96	1.2	1.1
7	.78	.70	.....	.....	.....	.....	1.15	.94	.71	.91	1.2	1.05
8	.79	.70	.....	.....	.....	.....	1.25	.99	.68	.89	1.15	1.05
9	.80	.70	.....	.92	.....	.....	1.2	.92	.66	.88	1.15	1.0
10	.79	.70	.....	.....	.....	.....	1.2	.86	.64	.85	1.15	1.0
11	.78	.70	.....	.....	.....	.....	1.2	.81	.61	1.05	1.1	1.2
12	.85	.70	.74	.....	.....	.....	1.15	.76	.59	1.15	1.1	1.2
13	.90	.70	.....	.....	1.65	1.65	.98	.74	.56	1.1	1.1	1.2
14	.86	.70	.....	.....	.....	.....	.86	.75	.54	1.0	1.1	1.15
15	.85	.71	.....	.....	.....	.....	.86	.89	.52	1.05	1.05	1.1
16	.81	.70	.....	1.1	.....	1.65	.88	.94	.50	1.3	1.05	1.1
17	.80	.70	.....	.....	.....	.....	.88	.96	.50	1.4	1.0	1.1
18	.80	.70	.....	.....	.....	1.85	.88	1.0	.50	1.4	1.05	1.05
19	.80	.70	1.00	.....	.....	.....	.85	1.05	.51	1.35	1.15	1.15
20	.78	.70	.....	.....	1.3	[a].85	.81	1.3	.51	1.4	1.2	1.15
21	.78	.70	.84	.....	.....	.....	.82	1.55	.50	1.5	1.3	1.1
22	.78	.70	.....	.....	.....	.....	.81	1.6	.48	1.5	1.35	1.05
23	.76	.70	.....	1.2	.....	.....	.80	1.6	.45	1.45	1.35	1.05
24	.75	.59	.....	.....	.....	.....	.91	1.65	.48	1.4	1.35	1.1
25	.75	.50	.....	.....	1.3	.....	1.05	1.7	.54	1.4	1.3	1.05
26	.75	.61	.90	.....	.....	.....	1.05	1.65	.59	1.35	1.3	1.0
27	.75	.90	.....	.....	1.35	1.2	1.1	1.6	.56	1.3	1.25	1.0
28	.74	1.10	.....	1.25	.....	.....	1.2	1.5	.52	1.25	1.2	.96
29	.72	.92	.....	.....	.....	.....	1.15	1.4	.50	1.2	1.15	.95
30	.72	.98	.....	1.3	.....	.....	1.1	1.25	.48	1.2	1.1	.94
31	.72	.....	.....	.....	.....	1.35	.....	1.15	.....	1.3	1.05	.....

[a] Gage height probably 1.0 foot too low.

NOTE.—Discharge relation affected by ice about Nov. 27, 1912 to Mar. 31, 1913. On Nov. 27, the observer reported river partly frozen over; backwater at gage.

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Daily discharge, in second-feet, of Elk River near Big Lake, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	161	129	.....	.....	.....	.....	336	211	250	62	310	190
2	153	129	.....	.....	.....	.....	307	208	222	57	310	204
3	153	129	.....	.....	.....	.....	307	236	208	139	294	204
4	151	129	.....	.....	.....	.....	250	219	191	159	278	247
5	148	126	.....	.....	.....	.....	250	205	173	185	262	218
6	146	124	.....	.....	.....	.....	264	191	158	180	247	218
7	143	124	.....	.....	.....	.....	264	205	146	167	247	204
8	146	124	.....	.....	.....	.....	292	219	139	162	232	204
9	148	124	.....	.....	.....	.....	278	200	135	159	232	190
10	146	124	.....	.....	.....	.....	278	184	130	152	232	190
11	143	124	.....	.....	.....	.....	278	171	123	204	218	247
12	161	124	.....	.....	.....	.....	264	158	119	232	218	247
13	174	124	.....	.....	.....	.....	216	154	113	218	218	247
14	164	124	.....	.....	.....	.....	184	156	108	190	218	232
15	161	124	.....	.....	.....	.....	184	191	104	204	204	218
16	151	124	.....	.....	.....	.....	189	205	100	278	204	218
17	148	124	.....	.....	.....	.....	189	211	100	310	190	218
18	148	124	.....	.....	.....	.....	189	222	100	310	204	204
19	148	124	.....	.....	.....	.....	181	236	102	294	232	232
20	143	124	.....	.....	.....	.....	171	307	102	310	247	232
21	143	124	.....	.....	.....	.....	173	380	100	343	278	218
22	143	124	.....	.....	.....	.....	171	395	96	343	294	204
23	138	124	.....	.....	.....	.....	168	395	90	326	294	204
24	136	98	.....	.....	.....	.....	197	410	96	310	294	218
25	136	78	.....	.....	.....	.....	236	426	108	310	278	204
26	136	102	.....	.....	.....	.....	236	410	119	294	278	190
27	136	100	.....	.....	.....	.....	250	395	113	278	262	190
28	134	98	.....	.....	.....	.....	278	365	104	262	247	180
29	129	96	.....	.....	.....	.....	264	336	100	247	232	177
30	129	94	.....	.....	.....	.....	250	292	96	247	218	174
31	129	.....	.....	.....	.....	.....	.....	264	.....	278	204	.....

NOTE.—Daily discharge computed from two fairly well defined rating curves. New rating curve used July 1 to Sept. 30.

Discharge estimated, because of ice, from gage heights, observer's notes, discharge measurements, and climatic records, as follows: Dec. 1–20, 97 second-feet; Dec. 21–31, 90 second-feet; Jan. 1–31, 70 second-feet; Feb. 1–28, 65 second-feet; and Mar. 1–31, 160 second-feet.

Monthly discharge of Elk River near Big Lake, Minn., for the year ending Sept. 30, 1913.

[Drainage area. 615 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	174	129	146	0.237	0.27	A.
November	129	78	118	.192	.21	B.
December	.....	.....	95	.154	.18	C.
January	.....	.....	70	.114	.13	C.
February	.....	.....	65	.106	.11	C.
March	.....	.....	160	.260	.30	C.
April	336	168	236	.384	.43	B.
May	426	154	263	.428	.49	C.
June	250	90	128	.208	.23	C.
July	343	57	233	.379	.44	B.
August	310	190	248	.403	.46	B.
September	247	174	211	.343	.38	B.
The year	.....	.....	165	.268	3.63	

NOTE.—See footnotes to tables of daily gage height and daily discharge.

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CROW RIVER AT ROCKFORD, MINN.

Location.—At highway bridge at Rockford, a little more than a mile below the junction of the North and South branches. Between the junction and the station are the outlets of Rebecca Lake and Lake Sarah, both very small streams.

Records available.—June 4, 1909, to September 30, 1913.

Drainage area.—2,520 square miles.

Gage.—Vertical staff; read morning and evening to hundredths. Limits of use: Hundredths below 5.5, half-tenths from 5.5 to 6.5, and tenths above 6.5 feet.

Channel and control.—Practically permanent.

Discharge measurements.—During high and medium stages made from the bridge; during low stages by wading at various sections.

Winter flow.—Prior to winter of 1911–12 very little ice formed and open-water rating curve applied throughout the year. During winters of 1911–12 and 1912–13 ice destroyed discharge relation making it necessary to base estimates on discharge measurements. Before the dam was destroyed the temperature of the larger body of water back of the dam was considerably above freezing and the water did not freeze quickly when released, but since the destruction of the dam natural conditions exist and ice forms.

Regulation.—On the north, middle, and south forks of Crow River are seven power plants with small storage and the flow at the various points is so slight that no appreciable effect of their operation is observable at the gage. A dam immediately above the gage was partly destroyed May 31, 1911, and has not yet been repaired.

Accuracy.—Records should be reliable except for periods when discharge relation may be affected by growth of grass in channel below gage.

Discharge measurements of Crow River at Rockford, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Feb. 4	S. B. Soulé	4.96	[a] 34
Apr. 7	W. G. Hoyt	5.84	[b] 546

[a] Complete ice cover at measuring section about 400 feet below gage. Nearly complete ice cover at control.
[b] Control clear.

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Daily gage height, in feet, of Crow River at Rockford, Minn., for the year ending Sept. 30, 1913.

[G. W. Florida, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	5.6	5.18	5.25	4.97	4.80	.....	5.65	5.8	5.6	5.29	6.8	6.7
2	5.55	5.16	5.20	4.96	.....	.....	5.7	5.9	5.48	5.26	6.7	6.8
3	5.5	5.14	5.12	4.95	.....	.....	5.8	5.8	5.40	5.32	6.7	7.1
4	5.49	5.11	5.04	4.96	4.96	.....	5.8	5.65	5.39	5.39	6.7	7.2
5	5.45	5.10	5.00	5.06	.....	.....	5.75	5.6	5.36	5.65	6.6	7.2
6	5.41	5.08	5.00	5.04	5.02	5.1	5.8	5.55	5.31	5.95	6.6	7.4
7	5.36	5.08	5.08	5.03	.....	.....	5.8	5.5	5.26	6.15	6.45	7.2
8	5.32	5.08	5.15	4.95	.....	.....	5.8	5.5	5.20	6.1	6.4	7.1
9	5.32	5.08	5.30	4.80	.....	.....	5.7	5.5	5.16	6.1	6.35	7.1
10	5.30	5.08	5.04	4.82	.....	5.15	5.7	5.5	5.10	6.05	6.3	7.0
11	5.45	5.12	5.04	4.80	.....	5.5	5.7	5.48	5.08	6.3	6.3	7.1
12	5.5	5.12	5.04	4.82	.....	6.1	5.75	5.46	5.07	6.45	6.25	7.1
13	5.49	5.12	5.04	4.82	5.00	6.45	5.8	5.43	5.04	6.6	6.2	7.1
14	5.45	5.08	4.99	4.80	.....	6.0	5.85	5.40	5.04	6.7	6.2	7.1
15	5.41	5.04	4.98	4.82	.....	5.5	5.85	5.55	5.04	6.8	6.15	7.2
16	5.40	5.02	5.00	4.84	.....	5.46	5.8	5.65	5.02	7.1	6.15	7.1
17	5.36	5.02	5.01	4.85	.....	5.42	5.7	5.65	5.02	7.5	6.15	7.0
18	5.34	5.02	4.99	4.84	.....	5.40	5.65	5.65	5.00	7.7	6.1	6.9
19	5.32	5.04	4.98	4.84	.....	5.38	5.6	5.65	4.98	7.8	6.1	6.8
20	5.30	5.06	4.97	4.85	4.85	5.36	5.6	5.8	5.11	7.7	6.2	6.6
21	5.30	5.08	4.98	4.86	.....	5.32	5.55	6.0	5.12	7.6	6.6	6.5
22	5.28	5.08	4.98	4.85	.....	5.24	5.55	6.1	5.04	7.5	7.0	6.5
23	5.26	5.09	4.98	4.84	.....	5.18	5.65	6.3	5.00	7.4	7.2	6.4
24	5.24	5.06	4.96	4.84	.....	5.13	5.7	6.3	4.99	7.2	7.4	6.35
25	5.23	5.04	4.95	4.84	.....	5.14	5.85	6.25	5.42	7.1	7.4	6.35
26	5.22	5.02	4.94	4.83	.....	5.16	6.0	6.2	5.16	7.1	7.3	6.3
27	5.22	5.02	4.95	4.84	4.85	5.26	6.1	6.05	5.27	7.0	7.2	6.25
28	5.22	5.00	4.96	4.84	.....	5.33	6.0	5.9	5.38	6.9	7.0	6.2
29	5.23	4.98	4.97	4.85	.....	5.42	5.9	5.75	5.37	6.8	6.9	6.2
30	5.22	4.99	4.98	4.84	.....	5.46	5.8	5.7	5.32	6.8	6.8	6.15
31	5.20	.....	4.98	4.82	.....	5.55	.....	5.6	.....	6.8	6.7	.....

NOTE.—Discharge relation probably affected by ice about Dec. 7–13 and Dec. 29, 1912, to Mar. 14, 1913, and by backwater from grass about Aug. 1 to Sept. 30, 1913.

Daily discharge, in second-feet, of Crow River at Rockford, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	395	209	237	.....	.....	.....	420	500	395	253	998	935
2	370	202	217	.....	.....	.....	445	555	336	241	935	998
3	345	194	187	.....	.....	.....	500	500	300	266	935	1,190
4	340	183	158	.....	.....	.....	500	420	296	296	935	1,260
5	322	179	144	.....	.....	.....	472	395	283	420	875	1,260
6	304	172	144	.....	.....	.....	500	370	261	582	875	1,400
7	283	172	144	.....	.....	.....	500	345	241	695	785	1,260
8	266	172	144	.....	.....	.....	500	345	217	665	755	1,190
9	266	172	144	.....	.....	.....	445	345	202	665	725	1,190
10	257	172	143	.....	.....	.....	445	345	179	638	695	1,130
11	322	187	143	.....	.....	.....	445	336	172	785	695	1,190
12	345	187	142	.....	.....	.....	472	327	168	875	665	1,190
13	340	187	142	.....	.....	.....	500	314	158	965	638	1,190
14	322	172	141	.....	.....	.....	528	300	158	1,030	638	1,190
15	304	158	138	.....	.....	345	528	370	158	1,100	610	1,260
16	300	151	144	.....	.....	327	500	420	151	1,290	610	1,190
17	283	151	148	.....	.....	309	445	420	151	1,570	610	1,130
18	274	151	141	.....	.....	300	420	420	144	1,710	582	1,060
19	266	158	138	.....	.....	291	395	420	138	1,790	582	998
20	257	165	134	.....	.....	283	395	500	183	1,710	638	875
21	257	172	138	.....	.....	266	370	610	187	1,640	875	815
22	249	172	138	.....	.....	233	370	665	158	1,570	1,130	815
23	241	176	138	.....	.....	209	420	785	144	1,500	1,260	755
24	233	165	131	.....	.....	190	445	785	141	1,360	1,400	725
25	229	158	128	.....	.....	194	528	755	309	1,290	1,400	725
26	225	151	125	.....	.....	203	610	725	202	1,290	1,320	695
27	225	151	128	.....	.....	241	665	638	245	1,220	1,260	665
28	225	144	131	.....	.....	270	610	555	291	1,160	1,130	638
29	229	138	131	.....	.....	309	555	472	287	1,100	1,060	638
30	225	141	131	.....	.....	327	500	445	266	1,100	998	610
31	217	.....	130	.....	.....	370	.....	395	.....	1,100	935	.....

NOTE.—Daily discharge determined as follows: Oct. 1, 1912, to July 31, 1913, from a well-defined rating curve; Aug. 1 to Sept. 30, 1913, estimated on account of backwater due to grass, on basis of discharge measurement made Oct. 21, 1913.

Discharge estimated, because of ice, from gage heights, observer's notes, one discharge measurement, and climatic records, as follows: Dec. 7–13, and 29–31, 1912; Jan. 1–31, 1913, 72 second-feet; Feb. 1–28, 45 second-feet; and Mar. 1–14, 150 second-feet.

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Monthly discharge of Crow River at Rockford, Minn., for the year ending Sept. 30, 1913.

[Drainage area 2,520 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	395	217	281	0.112	0.13	A.
November	209	138	169	.067	.07	A.
December	.....	.....	146	.058	.07	B.
January	.....	.....	72	.029	.03	D.
February	.....	.....	45	.018	.02	C.
March	.....	.....	218	.087	.10	C.
April	665	370	481	.191	.21	B.
May	785	300	477	.189	.22	B.
June	395	138	217	.086	.10	C.
July	1,790	241	1,030	.409	.47	C.
August	1,400	582	889	.353	.41	B.
September	1,400	610	1,010	.401	.45	B.
The year	1,790	.....	422	.167	2.28	

RUM RIVER AT CAMBRIDGE, MINN.

Location.—At highway bridge half a mile west of Cambridge. No tributary within several miles.

Records available.—June 12, 1909, to September 30, 1913.

Drainage area.—1,160 square miles.

Gage.—Vertical staff; read twice daily to quarter-tenths. Limits of use: Hundredths below 4.0 half-tenths from 4.0 to 5.0, and tenths above 5.0 feet.

Channel and control.—No well-defined control; channel shifting.

Discharge measurements.—Made from the bridge.

Winter flow.—Determined by measurements made through the ice.

Regulation.—Flow except during low water controlled by storage in and evaporation from the lakes in the drainage area above Onamia. There is a 10-foot dam and power plant at St. Francis, 20 miles below Cambridge by river; difference in elevation between crest of dam and water surface at gaging station about 6 feet. The fact that morning and evening gage heights during low-water are for the most part identical indicates that the St. Francis dam affects this station very little though the flow may fall below the crest at times during the day. The only dam at Cambridge is at Milaca and is used to form a pool from which water is pumped.

Accuracy.—Records poor. During the summer months grass grows in channel causing backwater in varying amount at gage.

Discharge measurements of Rum River at Cambridge, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 11	W. G. Hoyt	3.12	121	Apr. 9	W. G. Hoyt	4.18	379
Nov. 23	.....do	2.99	116	May 23	.....do	7.02	1,220
Dec. 30	S. B. Soulé	3.34	a 84	July 8	Hoyt and Peterson	5.23	408
Jan. 30	.....do	3.50	a 55.1	Sept. 4	S. B. Soulé	4.48	264
Feb. 27	.....do	3.60	a 61.9				

a Complete ice cover at control; about 90 per cent ice cover at measuring section.

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Daily gage height, in feet, of Rum River at Cambridge, Minn., for the year ending Sept. 30, 1913.

[Joseph Lofstrom, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3.40	3.00	3.00	.....	.....	.....	4.35	4.85	5.1	3.78	6.1	4.8
2	3.40	3.00	3.10	.....	.....	.....	4.8	4.6	4.85	3.66	6.0	4.65
3	3.35	3.00	3.10	3.40	.....	.....	5.6	4.5	4.6	3.74	5.8	4.55
4	3.30	3.00	.....	.....	.....	.....	5.6	4.4	4.4	3.88	5.6	4.45
5	3.25	3.00	3.10	.....	.....	.....	5.2	4.3	4.3	4.3	5.4	4.4
6	3.20	3.00	.....	.....	3.50	3.58	4.8	4.2	4.2	4.5	5.1	4.4
7	3.15	2.99	.....	.....	.....	.....	4.35	4.1	4.1	4.7	5.1	4.3
8	3.15	3.00	.....	.....	.....	.....	4.3	4.0	4.0	5.2	5.0	4.2
9	3.15	3.00	.....	3.35	.....	3.68	4.2	3.96	3.89	5.6	4.95	4.1
10	3.10	3.00	.....	.....	.....	.....	4.05	3.96	3.80	5.7	4.95	4.05
11	3.15	2.99	.....	.....	.....	3.80	3.95	3.99	3.74	5.7	5.1	4.05
12	3.20	2.96	3.10	.....	.....	.....	3.99	3.95	3.65	5.7	5.2	4.05
13	3.30	2.98	.....	.....	3.52	4.0	4.0	3.84	3.58	5.5	5.2	4.05
14	3.25	2.98	.....	.....	.....	.....	4.1	3.71	3.52	5.3	5.1	4.35
15	3.25	2.96	.....	.....	.....	.....	4.2	3.86	3.49	5.5	5.0	4.5
16	3.25	2.98	.....	3.40	.....	.....	4.2	4.1	3.44	6.1	4.9	4.4
17	3.20	2.95	.....	.....	.....	.....	4.1	4.55	3.42	6.4	4.85	4.25
18	3.20	2.95	.....	.....	.....	4.65	3.98	5.7	3.44	6.5	4.8	4.1
19	3.15	2.96	3.25	.....	.....	4.65	3.86	6.4	3.45	6.4	4.95	3.98
20	3.15	2.98	.....	.....	3.60	4.55	3.79	6.9	3.48	6.3	5.2	3.90
21	3.10	2.98	.....	.....	.....	4.3	3.79	7.1	3.45	6.1	5.7	3.79
22	3.10	2.98	.....	.....	.....	4.1	3.82	7.0	3.41	5.9	5.5	3.78
23	3.10	2.98	.....	3.42	.....	3.98	3.80	7.0	3.38	5.6	7.2	3.76
24	3.10	2.68	.....	.....	.....	.....	4.0	7.3	3.34	5.4	7.6	3.85
25	3.05	2.92	.....	.....	.....	.....	4.45	7.5	3.32	5.2	7.8	3.96
26	3.05	3.05	3.35	.....	.....	.....	4.6	7.6	3.26	5.2	7.6	3.94
27	3.05	3.10	.....	.....	3.60	3.95	5.0	7.3	3.40	5.1	7.1	3.88
28	3.00	3.10	.....	.....	.....	3.82	5.3	6.8	3.46	5.0	6.5	3.92
29	3.05	3.00	.....	.....	.....	3.95	5.3	6.2	3.69	5.2	5.9	3.98
30	3.05	3.00	3.35	3.50	.....	4.1	5.1	5.8	3.81	5.6	5.4	3.90
31	3.00	.....	.....	.....	.....	4.25	.....	5.4	.....	5.8	5.0	.....

NOTE.—Discharge relation affected by ice about Nov. 24, 1912, to Mar. 31, 1913.

Daily discharge, in second-feet, of Rum River at Cambridge, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	150	110	.....	.....	.....	.....	428	575	590	108	680	332
2	150	110	.....	.....	.....	.....	560	500	515	88	650	296
3	140	110	.....	.....	.....	.....	800	470	442	92	590	274
4	140	110	.....	.....	.....	.....	800	442	386	108	545	262
5	130	110	.....	.....	.....	.....	680	414	345	195	485	250
6	130	110	.....	.....	.....	.....	560	386	320	239	400	250
7	120	110	.....	.....	.....	.....	428	358	285	274	400	228
8	120	110	.....	.....	.....	.....	414	332	262	400	372	217
9	130	110	.....	.....	.....	.....	386	322	237	515	358	195
10	120	110	.....	.....	.....	.....	345	322	206	545	358	184
11	130	110	.....	.....	.....	.....	320	330	193	545	400	184
12	140	110	.....	.....	.....	.....	330	320	162	545	428	195
13	160	110	.....	.....	.....	.....	332	294	147	485	428	195
14	150	110	.....	.....	.....	.....	358	264	124	428	400	262
15	150	110	.....	.....	.....	.....	386	299	119	485	372	308
16	160	110	.....	.....	.....	.....	386	358	101	665	345	285
17	140	110	.....	.....	.....	.....	358	485	97	755	332	250
18	140	110	.....	.....	.....	.....	327	830	101	785	320	228
19	130	110	.....	.....	.....	.....	299	1,040	94	770	372	202
20	130	115	.....	.....	.....	.....	283	1,190	91	740	442	184
21	120	115	.....	.....	.....	.....	283	1,250	86	680	590	171
22	120	115	.....	.....	.....	.....	290	1,220	80	620	530	169
23	120	115	.....	.....	.....	.....	285	1,220	67	530	1,040	164
24	120	115	.....	.....	.....	.....	332	1,320	61	470	1,160	184
25	110	115	.....	.....	.....	.....	456	1,380	51	414	1,220	219
26	110	115	.....	.....	.....	.....	500	1,420	43	414	1,160	215
27	110	115	.....	.....	.....	.....	620	1,320	62	386	1,010	202
28	100	110	.....	.....	.....	.....	710	1,160	64	358	830	221
29	110	110	.....	.....	.....	.....	710	950	101	414	650	235
30	120	110	.....	.....	.....	.....	650	830	113	530	500	217
31	110	.....	.....	.....	.....	.....	.....	710	.....	590	386	.....

NOTE.—Daily discharge determined as follows: Oct. 1 to Nov. 23, 1912, by indirect methods for shifting channel; Nov. 24, 1912, to May 28, 1913, from a fairly well-defined rating curve; May 29 to Sept. 30, 1913, by shifting channel methods. Discharge estimated, because of ice, from gage heights, observer's notes, discharge measurements, and climatic records, as follows: Nov. 24–30, daily discharge; Dec. 1–31, 1912, 100 second-feet; Jan. 1–31, 1913, 69 second-feet; Feb. 1–28, 58 second-feet; and Mar. 1–31, 150 second-feet.

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Monthly discharge of Rum River at Cambridge, Minn., for the year ending Sept. 30, 1913.

[Drainage area, 1,160 square miles.]

Month.	Discharge in second-feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
October	160	100	129	B.
November	115	110	111	C.
December	.....	.....	100	C.
January	.....	.....	69	C.
February	.....	.....	58	C.
March	.....	.....	150	D.
April	800	283	454	B.
May	1,420	264	720	B.
June	590	43	182	C.
July	785	88	457	C.
August	1,220	320	573	C.
September	332	164	226	C.
The year	1,420	.....	271	

MINNESOTA RIVER NEAR MONTEVIDEO, MINN.

Location.—In sec. 19, T. 117 N., R. 40 W., at highway bridge, 1 mile south of Montevideo, a short distance below mouth of Chippewa River.

Records available.—July 23, 1909, to September 30, 1913.

Drainage area.—6,300 square miles.

Gage.—Chain gage attached to bridge; read morning and evening to quarter-tenths. Limits of use: Hundredths below 2.0, half-tenths from 2.0 to 3.0, and tenths 3.0 feet above. Datum of gage lowered 2 feet September 16, 1909, and 1 foot additional July 29, 1910, to avoid negative readings.

Channel and control.—Practically permanent.

Discharge measurements.—Made from bridge.

Winter flow.—Determined by measurements made through the ice.

Regulation.—Nearest dam at Granite Falls, but it does not influence this gaging station. No dam above station. The discharge of Chippewa River is so much less than that of the Minnesota that the control of the former by a dam at Montevideo has little effect on the Minnesota gage heights.

Discharge measurements of Minnesota River near Montevideo, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 28	S. B. Soulé	3.16	128	Feb. 21	S. B. Soulé	3.57	*a* 76
Jan. 23	do	3.48	*a* 84	Apr. 23	W. G. Hoyt	5.81	945
Feb. 21	do	3.56	*a* 74	Sept. 16	S. B. Soulé	2.86	219

a Complete ice cover.

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Daily gage height, in feet, of Minnesota River near Montevidco, Minn., for the year ending Sept. 30, 1913.

[Mrs. Mary Hendricks, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.8	2.3	2.35	.....	.....	.....	4.0	5.6	5.2	2.9	2.85	2.9
2	2.7	2.2	2.8	.....	.....	.....	5.8	5.6	5.2	2.9	3.1	3.0
3	2.4	2.2	2.3	.....	.....	.....	5.8	5.6	5.0	2.9	3.0	2.85
4	2.45	2.4	2.4	3.4	.....	.....	5.4	5.3	5.0	2.9	3.2	2.95
5	2.7	2.7	2.45	.....	.....	.....	5.0	5.5	4.9	3.0	2.8	3.1
6	2.4	2.7	2.35	.....	3.4	3.7	4.5	5.5	4.8	2.8	2.8	2.9
7	2.5	2.7	2.35	.....	.....	.....	4.3	5.4	4.7	2.85	2.8	2.75
8	2.8	2.35	2.4	.....	.....	.....	4.8	5.2	4.4	2.8	2.5	3.2
9	2.6	2.45	2.3	.....	.....	.....	5.3	5.2	4.3	2.7	2.7	3.2
10	2.3	2.4	2.5	.....	.....	.....	5.3	5.0	4.4	2.7	2.45	2.95
11	2.6	2.4	2.7	3.4	.....	.....	5.4	4.8	4.3	2.75	2.5	2.7
12	2.8	2.7	2.45	.....	.....	.....	5.4	4.8	4.1	2.65	2.6	2.95
13	2.5	2.7	2.65	.....	3.6	.....	5.3	4.9	4.0	2.5	2.65	2.95
14	2.5	2.5	2.8	.....	.....	.....	5.5	4.9	3.9	2.6	2.75	2.6
15	2.8	2.5	2.85	.....	.....	.....	6.0	4.8	3.7	2.65	2.55	2.85
16	2.75	2.6	3.2	.....	.....	.....	6.1	4.7	3.8	2.7	2.65	2.65
17	2.8	2.3	3.2	.....	.....	.....	6.0	4.6	3.7	2.55	2.45	2.7
18	2.7	2.4	2.85	3.5	.....	.....	6.2	4.6	3.4	2.55	2.9	2.7
19	2.7	2.6	3.1	.....	.....	.....	5.9	4.8	3.4	2.65	3.1	2.6
20	2.2	2.6	3.1	.....	3.6	3.6	5.8	4.9	3.3	2.55	3.0	2.7
21	2.6	2.7	2.9	.....	3.6	.....	5.9	5.2	3.4	2.9	3.0	2.65
22	2.85	2.6	2.8	.....	.....	.....	5.8	5.3	3.2	3.2	3.1	2.7
23	2.7	2.3	3.2	3.6	.....	.....	5.8	5.4	3.2	3.3	2.9	2.5
24	2.15	2.4	3.2	.....	.....	.....	5.9	5.6	3.3	3.2	2.95	2.4
25	2.3	2.3	3.1	.....	.....	.....	5.9	5.6	3.2	2.95	3.2	2.5
26	2.75	2.6	3.0	.....	.....	.....	6.0	5.6	3.2	2.85	3.2	2.5
27	2.6	2.8	3.2	.....	3.7	.....	5.8	5.5	3.2	2.8	3.2	2.45
28	2.4	2.8	3.2	.....	.....	3.7	6.0	5.5	3.2	3.2	3.4	2.4
29	2.7	2.65	.....	.....	.....	.....	5.8	5.4	2.8	3.1	3.4	2.55
30	2.9	2.7	.....	3.8	.....	.....	5.7	5.5	3.1	2.9	3.3	2.6
31	2.7	.....	.....	.....	.....	.....	.....	5.5	.....	2.8	2.55	.....

NOTE.—Discharge relation affected by ice about Nov. 26, 1912, to Mar. 31, 1913.

Daily discharge, in second-feet, of Minnesota River near Montevideo, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	181	120	.....	.....	.....	.....	418	870	745	210	202	210
2	168	108	.....	.....	.....	.....	934	870	745	210	242	226
3	132	108	.....	.....	.....	.....	934	870	685	210	226	202
4	138	132	.....	.....	.....	.....	807	776	685	210	260	218
5	168	168	.....	.....	.....	.....	685	838	656	226	194	242
6	132	168	.....	.....	.....	.....	543	838	627	194	194	210
7	144	168	.....	.....	.....	.....	490	807	599	202	194	186
8	181	126	.....	.....	.....	.....	627	745	516	194	148	260
9	156	138	.....	.....	.....	.....	776	745	490	178	178	260
10	120	132	.....	.....	.....	.....	776	685	516	178	141	218
11	156	132	.....	.....	.....	.....	807	627	490	186	148	178
12	181	168	.....	.....	.....	.....	807	627	442	170	162	218
13	144	168	.....	.....	.....	.....	776	656	418	148	170	218
14	144	144	.....	.....	.....	.....	838	656	396	162	186	162
15	181	144	.....	.....	.....	.....	1,000	627	354	170	155	202
16	174	156	.....	.....	.....	.....	1,030	599	374	178	170	170
17	181	120	.....	.....	.....	.....	1,000	571	354	155	141	178
18	168	132	.....	.....	.....	.....	1,070	571	296	155	210	178
19	168	156	.....	.....	.....	.....	967	627	296	170	242	162
20	108	156	.....	.....	.....	.....	934	656	278	155	226	178
21	156	168	.....	.....	.....	.....	967	745	296	210	226	170
22	188	156	.....	.....	.....	.....	934	776	260	260	242	178
23	168	120	.....	.....	.....	.....	934	807	260	278	210	148
24	102	132	.....	.....	.....	.....	967	870	278	260	218	134
25	120	120	.....	.....	.....	.....	967	870	260	218	260	148
26	174	.....	.....	.....	.....	.....	1,000	870	260	202	260	148
27	156	.....	.....	.....	.....	.....	934	838	260	194	260	141
28	132	.....	.....	.....	.....	.....	1,000	838	260	260	296	134
29	168	.....	.....	.....	.....	.....	934	807	194	242	296	155
30	194	.....	.....	.....	.....	.....	902	838	242	210	278	162
31	168	.....	.....	.....	.....	.....	.....	838	.....	194	155	.....

NOTE.—Daily discharge computed from two rating curves well defined above 400 second-feet and fairly well defined below this point. Revised rating curve used May 23 to Sept. 30 based on discharge measurement made Sept. 16. Discharge estimated, because of ice, from gage heights, observer's notes, 4 discharge measurements, and climatic records as follows: Nov. 26–30, 125 second-feet; Dec. 1–31, 125 second-feet; Jan. 1–23, 102 second-feet; Jan. 24–31, 82 second-feet; Feb. 1–21, 77 second-feet; Feb. 22–28, 73 second-feet; and Mar. 1–31, 150 second-feet.

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Monthly discharge of Minnesota River near Montevideo, Minn., for the year ending Sept. 30, 1913.

[Drainage area, 6,300 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	194	102	156	0.025	0.03	B.
November	.....	.....	a 139	.022	.02	C.
December	.....	.....	125	.020	.02	C.
January	.....	.....	96.8	.015	.02	C.
February	.....	.....	76.0	.012	.01	C.
March	.....	.....	150	.024	.03	C.
April	1,070	418	859	.136	.15	B.
May	870	571	753	.120	.14	A.
June	745	194	418	.066	.07	A.
July	278	148	200	.032	.04	B.
August	296	141	209	.033	.04	B.
September	260	134	186	.030	.03	B.
The year	1,070	.....	282	.045	.60	

a Differs from value published in "Report of the water-resources investigation of Minnesota, 1911-1912," because of estimate of flow Nov. 26 to 30 made from information obtained after publication of Minnesota report.

NOTE.—See footnotes to tables of daily gage height and daily discharge.

MINNESOTA RIVER NEAR MANKATO, MINN.

Location.—At Sibley Park, 2 miles above the center of Mankato, a few hundred yards below the mouth of Blue Earth River, the nearest tributary.

Records available.—May 20, 1903, to September 30, 1913.

Drainage area.—14,600 square miles.

Gage.—Chain gage; read once daily to tenths. Gage checked with wye level April 24, 1914, and found to read 0.09 foot too high; cause, settlement of gage. Settlement is assumed to have occurred gradually since the previous checking of the gage with level April 3, 1913.

Channel and control.—No definite control; channel fairly permanent except during high wtaer.

Discharge measurements.—Made from highway bridge in center of Mankato; at low stage by wading a short distance below gage.

Winter flow.—Determined by measurements made through the ice.

Regulation.—Nearest dam on the river is at Minnesota Falls, 140 miles upstream; no dam below station. A dam on Blue Earth River at Rapidan, a few miles above the mouth, controls the flow, but it is such a small part of the entire discharge at the Mankato station that the effect of such regulation is slight.

Maximum and minimum flow.—The highest known stage of the river occurred in 1881 and is shown by a well-marked line in Mankato. The stage was approximately 27 feet above the zero of the present gage. This estimate was corroborated by M. B. Haynes, city engineer, of Mankato, who stated that the high water occurred after the ice went out and was not caused by backwater. The corresponding discharge was approximately 65,000 second-feet. Since the establishment of the gage the highest stage recorded was 21.2 feet on June 26, 1908. The lowest stage recorded was 0.5 in 1911 when the flow was about 89 second-feet for a considerable time.

Accuracy.—Measurements made during earlier years indicated changing conditions of flow, and accordingly the discharge for years previous to 1907 was obtained largely by the indirect method. These results can not be considered as accurate as the later ones, which were based on well-defined rating curves.

Cooperation.—Since 1906 gage heights have been furnished by the United States Weather Bureau.

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Discharge measurements of Minnesota River near Mankato, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 16[a]	S. B. Soulé	1.47	234	Apr. 3[c]	S. B. Soulé	3.27	1,570
Jan. 21[b]	do	1.57	122	Sept. 19[d]	do	[e] 1.43	323
Mar. 5[b]	do	1.74	140				

[a] Made under complete ice cover; river about 10 per cent open at control.
[b] Complete ice cover.
[c] Made from highway bridge about 2 miles below gage.
[d] Made by wading at a section about 300 feet below gage.
[e] Any error that may have existed in gage Sept. 19, 1913, entered also into gage height of discharge measurement made on that date.

Daily gage height, in feet, of Minnesota River near Mankato, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.2	1.3	1.1	1.4	1.8	1.6	4.5	4.7	4.9	4.1	2.2	1.5
2	1.2	1.3	1.1	1.4	1.5	1.6	3.7	4.7	4.8	5.0	2.2	1.5
3	1.2	1.2	1.0	1.5	1.3	1.7	3.2	4.5	4.3	3.5	2.2	1.5
4	1.2	1.2	1.3	1.5	1.2	1.7	3.0	4.3	4.5	3.7	2.1	1.6
5	1.2	1.2	1.3	1.5	1.1	1.7	2.7	4.8	4.4	3.6	2.0	1.6
6	1.2	1.3	1.3	1.5	1.1	1.7	2.9	4.9	4.1	3.4	2.0	1.6
7	1.2	1.3	1.3	1.5	1.4	1.8	3.2	4.8	4.0	3.2	2.0	1.6
8	1.2	1.3	1.3	1.5	1.5	1.8	3.4	5.0	3.9	3.1	2.2	1.6
9	1.3	1.3	1.3	1.4	1.5	2.6	3.3	4.3	3.6	3.0	2.3	1.5
10	1.3	1.2	1.4	1.4	1.5	3.0	3.1	4.2	3.3	2.7	2.3	1.5
11	1.2	1.1	1.4	1.4	1.5	3.3	4.0	4.2	3.3	2.6	2.2	1.7
12	1.4	1.2	1.4	1.4	1.5	3.8	4.3	4.1	3.2	2.7	1.9	1.7
13	1.4	1.2	1.4	1.2	1.5	3.5	5.5	3.9	3.2	2.7	1.8	1.6
14	1.4	1.3	1.4	1.2	1.4	3.7	5.8	4.1	3.1	2.6	1.8	1.6
15	1.3	1.3	1.4	1.2	1.4	3.9	6.6	4.3	3.1	2.6	1.7	1.6
16	1.3	1.2	1.3	1.2	1.4	3.2	6.5	4.1	3.0	2.5	1.7	1.5
17	1.3	1.2	1.3	1.2	1.5	4.1	6.6	4.6	2.8	2.5	1.7	1.5
18	1.3	1.1	1.4	1.2	1.7	2.9	6.4	4.5	2.7	2.4	1.5	1.5
19	1.3	1.2	1.4	1.1	1.7	2.4	6.3	5.0	2.6	2.4	1.5	1.5
20	1.3	1.2	1.4	1.1	1.8	2.6	5.4	5.4	2.6	2.3	1.9	1.5
21	1.3	1.2	1.4	1.1	1.8	2.6	5.5	5.7	2.8	2.2	2.0	1.5
22	1.3	1.2	1.4	1.1	1.8	2.3	5.0	5.5	2.5	2.1	2.0	1.5
23	1.3	1.2	1.4	1.2	1.7	2.2	4.2	5.7	2.4	2.1	1.9	1.4
24	1.3	1.0	1.3	1.2	1.7	3.0	4.8	5.6	2.4	2.1	1.9	1.4
25	1.3	1.0	1.3	1.2	1.5	2.6	5.1	6.3	2.7	2.1	1.8	1.5
26	1.3	1.1	1.3	1.4	1.5	2.3	4.9	5.9	2.9	2.1	1.8	1.5
27	1.3	1.1	1.3	1.5	1.5	2.5	5.9	5.2	3.4	2.1	1.7	1.5
28	1.3	1.1	1.3	1.6	1.5	3.4	5.0	5.4	3.9	2.1	1.8	1.5
29	1.3	1.2	1.4	1.6	.....	3.7	5.2	5.7	5.0	2.4	1.8	1.4
30	1.3	1.2	1.4	2.0	.....	3.9	4.9	5.6	4.8	2.3	1.7	1.4
31	1.3	.....	1.4	2.0	.....	4.2	.....	5.5	.....	2.3	1.5	.....

NOTE.—Discharge relation affected by ice about Dec. 1, 1912, to Mar. 17, 1913. Gage heights not corrected for errors due to settlement of gage. See station description.

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Daily discharge, in second-feet, of Minnesota River near Mankato, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	270	320	.....	.....	.....	.....	2,750	2,950	3,170	2,350	775	360
2	270	320	.....	.....	.....	.....	1,960	2,950	3,060	3,280	775	360
3	270	270	.....	.....	.....	.....	1,520	2,750	2,550	1,780	775	360
4	270	270	.....	.....	.....	.....	1,360	2,550	2,750	1,960	710	415
5	270	270	.....	.....	.....	.....	1,120	3,060	2,650	1,860	650	415
6	270	320	.....	.....	.....	.....	1,280	3,170	2,350	1,690	650	415
7	270	320	.....	.....	.....	.....	1,520	3,060	2,250	1,520	650	415
8	270	320	.....	.....	.....	.....	1,690	3,280	2,150	1,440	775	415
9	320	320	.....	.....	.....	.....	1,600	2,550	1,860	1,360	840	360
10	320	270	.....	.....	.....	.....	1,440	2,450	1,600	1,120	840	360
11	270	225	.....	.....	.....	.....	2,250	2,450	1,600	1,050	775	470
12	370	270	.....	.....	.....	.....	2,550	2,350	1,520	1,120	590	470
13	370	270	.....	.....	.....	.....	3,900	2,150	1,520	1,120	530	415
14	370	320	.....	.....	.....	.....	4,310	2,350	1,440	1,050	530	415
15	320	320	.....	.....	.....	.....	5,460	2,550	1,440	1,050	470	415
16	320	270	.....	.....	.....	.....	5,310	2,350	1,360	980	470	360
17	320	270	.....	.....	.....	.....	5,460	2,850	1,200	980	470	360
18	320	225	.....	.....	.....	1,280	5,160	2,750	1,120	910	360	360
19	320	270	.....	.....	.....	910	5,010	3,280	1,050	910	300	260
20	320	270	.....	.....	.....	1,050	3,770	3,770	1,050	840	590	360
21	320	270	.....	.....	.....	1,050	3,900	4,170	1,200	775	650	360
22	320	270	.....	.....	.....	840	3,280	3,900	980	710	650	360
23	320	270	.....	.....	.....	775	2,450	4,170	910	710	590	310
24	320	180	.....	.....	.....	1,360	3,060	4,030	910	710	590	310
25	320	180	.....	.....	.....	1,050	3,400	5,010	1,120	710	530	360
26	320	225	.....	.....	.....	840	3,170	4,450	1,280	710	530	360
27	320	225	.....	.....	.....	980	4,450	3,520	1,690	710	470	360
28	320	225	.....	.....	.....	1,690	3,280	3,770	2,150	710	530	360
29	320	270	.....	.....	.....	1,960	3,520	4,170	3,280	910	530	310
30	320	270	.....	.....	.....	2,150	3,170	4,030	3,060	840	470	310
31	320	.....	.....	.....	.....	2,450	.....	3,900	.....	840	360	.....

NOTE.—Daily discharge computed from two fairly well-defined rating curves. Discharge estimated, because of ice, from gage heights, observer's notes, 3 discharge measurements, and climatic records, as follows: Dec. 1–25, 250 second-feet; Dec. 26–31, 220 second-feet; Jan. 1–20, 161 second-feet; Jan. 21–31, 124 second-feet; Feb. 1–28, 131 second-feet; and Mar. 1–17, 350 second-feet. Low-water section of rating curve for last part of year ending Sept. 30, 1913, based on discharge measurement made on Sept. 19, 1913, and is therefore applicable to the gage heights as read by the observer.

Monthly discharge of Minnesota River near Mankato, Minn., for the year ending Sept. 30, 1913.

[Drainage area, 14,600 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	370	270	310	0.021	0.02	B.
November	320	180	270	.018	.02	B.
December	.....	.....	244	.017	.02	C.
January	.....	.....	148	.010	.01	C.
February	.....	.....	131	.009	.01	D.
March	2,450	.....	785	.054	.06	C.
April	5,460	1,120	3,100	.212	.24	B.
May	5,010	2,150	3,250	.223	.26	B.
June	3,280	910	1,810	.124	.14	A.
July	3,280	710	1,180	.081	.09	A.
August	840	360	596	.041	.05	B.
September	470	310	375	.026	.03	A.
The year	5,460	.....	1,020	.070	.95	

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LAC QUI PARLE RIVER AT LAC QUI PARLE, MINN.

Location.—In sec. 26, T. 118 N., R. 42 W., at highway bridge at Lac Qui Parle, in Lac Qui Parle County, a short distance above mouth of Threemile Creek.

Records available.—April 27, 1910, to September 30, 1913.

Drainage area.—838 square miles.

Gage.—Vertical staff; read once daily to quarter-tenths. Limits of use: Hundredths below 1.5, half-tenths from 1.5 to 3.0, and tenths above 3.0 feet.

Channel and control.—Gravel; shifts slightly during flood stages.

Discharge measurements.—Made from bridge.

Winter flow.—Observations discontinued during winter. Estimate for winter of 1912–13 based on flow of Minnesota River at Montevideo and the Chippewa near Watson, and the discharge measurement on February 22.

Regulation.—No dams control flow at the present time.

Accuracy.—Records only fair because of slight shifting of channel and rating curves only fairly defined.

Discharge measurements of Lac Qui Parle River at Lac Qui Parle, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Feb. 22	S. B. Soulé	.....	[a] 0.1	Sept. 15	S. B. Soulé	0.37	[b] 0.49
Apr. 22	W. G. Hoyt	2.44	170	15	.....do	.37	[b] 0.53

[a] River almost frozen completely to bed. [b] Measurement made by wading.

Daily gage height, in feet, of Lac Qui Parle River at Lac Qui Parle, Minn., for the year ending Sept. 30, 1913.

[C. A. Gould, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	0.80	0.88	.....	.....	.....	.....	8.8	2.4	2.3	1.02	0.80	0.42
2	.85	.88	.....	.....	.....	.....	8.6	2.4	2.1	.95	.70	.45
3	.85	.88	.....	.....	.....	.....	4.0	2.3	2.05	.90	.70	.85
4	.88	.85	.....	.....	.....	.....	3.3	2.3	2.0	1.05	.65	1.05
5	.90	.85	.....	.....	.....	.....	3.0	2.3	1.9	1.40	.60	.78
6	.90	.82	.....	.....	.....	.....	2.55	2.25	1.85	1.18	.60	.62
7	.88	.90	.....	.....	.....	.....	2.3	2.2	1.8	1.30	.60	.55
8	.88	.90	.....	.....	.....	.....	2.35	2.1	1.65	1.6	.58	.48
9	.88	.90	.....	.....	.....	.....	2.35	2.0	1.6	1.55	.55	.45
10	.88	.90	.....	.....	.....	.....	2.25	2.0	1.55	1.5	.55	.45
11	.85	.90	.....	.....	.....	.....	2.2	2.0	1.45	1.38	.55	.45
12	.88	.88	.....	.....	.....	.....	2.0	1.9	1.40	1.32	.52	.41
13	.85	.88	.....	.....	.....	.....	2.15	1.85	1.40	1.25	.55	.40
14	.85	.88	.....	.....	.....	.....	2.7	1.8	1.28	1.12	.55	.40
15	.85	.90	.....	.....	.....	.....	5.4	1.8	1.20	1.10	.55	.38
16	.85	.90	.....	.....	.....	.....	5.6	1.9	1.15	1.22	.52	.35
17	.85	.85	.....	.....	.....	.....	4.8	1.9	1.10	1.15	.52	.35
18	.90	.75	.....	.....	.....	.....	3.8	2.05	1.02	1.22	.82	.35
19	.90	.85	.....	.....	.....	.....	3.2	2.0	.98	1.22	.70	.30
20	.98	.88	.....	.....	.....	.....	2.85	2.1	1.08	1.30	.82	.30
21	.98	.90	.....	.....	.....	.....	2.65	2.15	1.10	1.32	.70	.30
22	.88	.88	.....	.....	.....	.....	2.45	2.65	1.05	1.32	.62	.28
23	.90	.95	.....	.....	.....	.....	2.45	3.4	1.42	1.30	.60	.28
24	.90	.82	.....	.....	.....	.....	2.4	3.5	1.6	1.20	.55	.35
25	.90	.85	.....	.....	.....	.....	2.6	3.1	1.6	1.15	.55	.32
26	.88	1.00	.....	.....	.....	.....	3.3	2.85	1.6	1.11	.52	.30
27	.88	.....	.....	.....	.....	.....	3.6	2.7	1.48	1.10	.50	.30
28	.85	.....	.....	.....	.....	.....	3.3	2.7	1.38	1.05	.50	.30
29	.88	.....	.....	.....	.....	.....	2.9	2.8	1.12	1.00	.45	.30
30	.82	.....	.....	.....	.....	.....	2.6	2.6	1.12	.90	.45	.30
31	.85	.....	.....	.....	.....	.....	.....	2.4	.....	.88	.42	.....

NOTE.—Discharge relation affected by ice about Nov. 26, 1912, to Apr. 3, 1913.

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Daily discharge, in second-feet, of Lac Qui Parle River at Lac Qui Parle, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	9	12	.....	.....	.....	.....	.....	162	149	26	14	1.3
2	11	12	.....	.....	.....	.....	.....	162	124	22	10	1.8
3	11	12	.....	.....	.....	.....	.....	149	118	19	10	16
4	12	11	.....	.....	.....	.....	301	149	112	28	8.0	18
5	13	11	.....	.....	.....	.....	253	149	101	53	6.0	13
6	13	10	.....	.....	.....	.....	184	142	96	37	6.0	6.8
7	12	13	.....	.....	.....	.....	149	136	91	45	6.0	4.2
8	12	13	.....	.....	.....	.....	156	124	76	71	5.3	2.2
9	12	13	.....	.....	.....	.....	156	112	71	66	4.2	1.8
10	12	13	.....	.....	.....	.....	142	112	66	62	4.2	1.8
11	11	13	.....	.....	.....	.....	136	112	58	51	4.2	1.8
12	12	12	.....	.....	.....	.....	112	101	53	47	3.2	1.2
13	11	12	.....	.....	.....	.....	130	96	53	42	4.2	1.0
14	11	12	.....	.....	.....	.....	206	91	44	32	4.2	1.0
15	11	13	.....	.....	.....	.....	660	91	38	31	4.2	.9
16	11	13	.....	.....	.....	.....	696	101	34	39	3.2	.6
17	11	11	.....	.....	.....	.....	553	101	31	34	3.2	.6
18	13	8	.....	.....	.....	.....	383	118	26	39	15	.6
19	13	11	.....	.....	.....	.....	285	112	24	39	10	.3
20	16	12	.....	.....	.....	.....	229	124	30	45	15	.3
21	16	13	.....	.....	.....	.....	198	130	31	47	10	.3
22	12	12	.....	.....	.....	.....	169	198	28	47	6.8	.3
23	13	15	.....	.....	.....	.....	169	317	55	45	6.0	.3
24	13	10	.....	.....	.....	.....	162	333	71	38	4.2	.6
25	13	11	.....	.....	.....	.....	191	269	71	34	4.2	.4
26	12	.....	.....	.....	.....	.....	301	229	71	32	3.2	.3
27	12	.....	.....	.....	.....	.....	349	206	60	31	2.5	.3
28	11	.....	.....	.....	.....	.....	301	206	51	28	2.5	.3
29	12	.....	.....	.....	.....	.....	237	221	32	25	1.8	.3
30	10	.....	.....	.....	.....	.....	191	191	32	19	1.8	.3
31	11	.....	.....	.....	.....	.....	.....	162	.....	18	1.3	.....

NOTE.—Daily discharge computed from a rating curve well defined between 14 and 678 second-feet (gage heights, 0.8 and 5.5 feet) and fairly well defined below 14 second-feet. Discharge estimated, because of ice, from one discharge measurement, climatic records, and comparison with the flow of Minnesota River near Montevideo, as follows: Nov. 26–30, 9 second-feet; Dec. 1–31, 1912, 5 second-feet; Jan. 1–31, 1913, 4 second-feet; Feb. 1–28, 1 second-foot; Mar. 1–31 10 second-feet; and April 1–3, 200 second-feet.

Monthly discharge of Lac Qui Parle River at Lac Qui Parle, Minn., for the year ending Sept. 30, 1913.

[Drainage area, 838 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	16	9	12.0	0.014	0.02	D.
November	15	.....	11.4	.014	.02	D.
December	.....	.....	5	.0060	.007	
January	.....	.....	4	.0048	.006	
February	.....	.....	1	.0012	.001	
March	.....	.....	10	.012	.01	
April	696	112	253	.302	.34	B.
May	333	91	158	.189	.22	B.
June	149	24	63.2	.075	.08	B.
July	71	18	38.5	.046	.05	B.
August	15	1.3	5.95	.0071	.008	C.
September	28	.3	2.95	.0035	.004	C.
The year	696	.....	47.1	.056	.77	

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CHIPPEWA RIVER NEAR WATSON, MINN.

Location.—On line between secs. 10 and 15, T. 118 N., R. 41 W., at highway bridge 2½ miles northeast of Watson, 10 miles above mouth of river, and about 2 miles below mouth of Dry Weather Creek.

Records available.—July 6, 1909, to September 30, 1913.

Drainage area.—1,940 square miles.

Gage.—Chain gage attached to bridge; read in the afternoon to quarter-tenths. Limits of use: Hundredths below 5.0, half-tenths from 5.0 to 6.0, and tenths above 6.0 feet.

Channel and control.—Slightly shifting during flood stages.

Discharge measurements.—Made from bridge and by wading.

Winter flow.—During period of ice in 1912–13 based on direct relation between flow at Montevideo and Watson supplemented by one discharge measurement.

Regulation.—Some slight regulation may have been due at one time to a flour mill working under an 8-foot head, but this dam is now out and the flow is natural. No backwater at station from dam at Montevideo.

Accuracy.—Records good; based on a fairly well-defined curve.

Discharge measurements of Chippewa River near Watson, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Feb. 22	S. B. Soulé	(a)	2.8
Apr. 22	W. G. Hoyt	5.17	120
Sept. 15	S. B. Soulé	4.97	94

a Measurement made near the mouth of river. Gage not visited.

Daily gage height, in feet, of Chippewa River near Watson, Minn., for the year ending Sept. 30, 1913.

[Clifford Bonde, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4.70	4.62	.....	.....	.....	.....	5.0	5.3	5.8	4.29	5.5	5.05
2	4.70	4.65	.....	.....	.....	.....	4.22	5.35	5.65	4.25	5.4	5.4
3	4.68	4.68	.....	.....	.....	.....	4.62	5.2	.....	.....	5.3	5.8
4	4.65	4.68	.....	.....	.....	.....	4.45	5.2	5.45	4.50	5.25	.....
5	4.60	4.65	.....	.....	.....	.....	4.55	5.25	.....	4.48	5.2	.....
6	4.62	4.55	.....	.....	.....	.....	4.82	5.3	5.3	4.48	5.15	5.1
7	4.65	4.65	.....	.....	.....	.....	4.90	.....	5.2	4.48	5.1	5.0
8	4.65	4.60	.....	.....	.....	.....	5.2	5.2	5.1	4.48	5.1	5.0
9	4.68	4.60	.....	.....	.....	.....	5.3	5.3	5.0	4.42	5.05	5.0
10	4.68	4.62	.....	.....	.....	.....	6.0	5.2	4.90	4.35	5.1	4.95
11	4.70	4.61	.....	.....	.....	.....	5.9	5.2	4.88	4.42	5.1	5.2
12	4.72	4.58	.....	.....	.....	.....	5.4	5.2	4.85	4.40	4.95	5.1
13	4.70	4.60	.....	.....	.....	.....	5.5	5.2	4.80	4.38	5.0	5.0
14	4.68	4.62	.....	.....	.....	.....	5.4	5.2	4.72	4.40	4.90	5.0
15	4.68	4.62	.....	.....	.....	.....	5.35	5.3	4.70	4.42	4.88	4.98
16	4.68	4.60	.....	.....	.....	.....	5.4	5.4	4.68	4.58	4.88	4.95
17	4.68	4.68	.....	.....	.....	.....	5.4	5.5	4.60	4.60	4.90	4.92
18	4.68	4.70	.....	.....	.....	.....	5.3	5.65	4.45	4.72	5.0	4.88
19	4.70	4.70	.....	.....	.....	.....	5.2	5.9	4.55	4.90	4.95	4.85
20	4.68	4.60	.....	.....	.....	.....	5.2	6.0	4.75	5.0	5.2	4.82
21	4.65	4.58	.....	.....	.....	.....	5.2	6.1	3.55	5.10	5.2	.....
22	4.65	4.55	.....	.....	.....	.....	5.2	6.2	4.50	5.1	5.25	4.82
23	4.62	4.60	.....	.....	.....	.....	5.2	6.2	4.45	.....	5.3	4.85
24	4.62	4.62	.....	.....	.....	.....	5.3	6.3	4.40	5.3	5.4	4.88
25	4.62	4.71	.....	.....	.....	.....	5.3	6.3	4.42	5.45	5.4	4.82
26	4.61	4.70	.....	.....	.....	.....	5.3	6.4	4.45	5.5	5.45	4.80
27	4.61	4.70	.....	.....	.....	.....	5.4	6.4	4.42	5.55	5.4	4.82
28	4.62	4.68	.....	.....	.....	.....	5.4	6.3	4.35	5.5	5.35	4.82
29	4.60	4.65	.....	.....	.....	.....	5.4	6.2	4.30	5.6	5.3	4.85
30	4.60	4.62	.....	.....	.....	.....	5.35	6.0	4.35	5.6	5.2	4.75
31	4.65	.....	.....	.....	.....	5.05	.....	5.8	.....	5.5	5.1	.....

NOTE.—Discharge relation affected by ice about Nov. 25, 1912, to Apr. 3, 1913.

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Daily discharge, in second-feet, of Chippewa River near Watson, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	65	59	.....	.....	.....	.....	35	137	210	36	165	105
2	65	61	.....	.....	.....	.....	40	144	188	34	151	151
3	63	63	.....	.....	.....	.....	55	124	a 173	a 42	137	210
4	61	63	.....	.....	.....	.....	46	124	158	49	130	a 177
5	57	61	.....	.....	.....	.....	53	130	a 148	48	124	a 144
6	59	53	.....	.....	.....	.....	78	137	137	48	118	111
7	61	61	.....	.....	.....	.....	87	a 130	124	48	111	99
8	61	57	.....	.....	.....	.....	124	124	111	48	111	99
9	63	57	.....	.....	.....	.....	137	137	99	43	105	99
10	63	59	.....	.....	.....	.....	240	124	87	39	111	93
11	65	58	.....	.....	.....	.....	225	124	85	43	111	124
12	67	55	.....	.....	.....	.....	151	124	82	42	93	111
13	65	57	.....	.....	.....	.....	165	121	76	41	99	99
14	63	59	.....	.....	.....	.....	151	124	68	42	87	99
15	63	59	.....	.....	.....	.....	144	137	66	43	85	97
16	63	57	.....	.....	.....	.....	151	151	64	55	85	93
17	63	63	.....	.....	.....	.....	151	165	57	57	87	89
18	63	65	.....	.....	.....	.....	137	188	46	68	99	85
19	65	65	.....	.....	.....	.....	124	225	53	87	93	82
20	63	57	.....	.....	.....	.....	124	240	71	99	124	78
21	61	55	.....	.....	.....	.....	124	256	53	111	124	a 78
22	61	53	.....	.....	.....	.....	124	272	49	111	130	78
23	59	57	.....	.....	.....	.....	124	272	46	a 124	137	82
24	59	59	.....	.....	.....	.....	137	288	42	137	151	85
25	59	.....	.....	.....	.....	.....	137	288	43	158	151	78
26	58	.....	.....	.....	.....	.....	137	304	46	165	158	76
27	58	.....	.....	.....	.....	.....	151	304	43	172	151	78
28	59	.....	.....	.....	.....	.....	151	288	39	165	144	78
29	57	.....	.....	.....	.....	.....	151	272	36	180	137	82
30	57	.....	.....	.....	.....	.....	144	240	39	180	124	71
31	61	.....	.....	.....	.....	.....	.....	210	.....	165	111	.....

a Interpolated.

NOTE.—Daily discharge computed from two well-defined rating curves. Curve used Apr. 4 to Sept. 30 based on nine discharge measurements made in 1913 and 1914. Discharge estimated, because of ice, from one discharge measurement and the flow of Minnesota River near Montevideo and of Lac Qui Parle River at Lac Qui Parle, as follows: Nov. 25–30, 59 second-feet; Dec. 1–31, 45 second-feet; Jan. 1–31, 23 second-feet; Feb. 1–28, 9 second-feet; and Mar. 1–31, 30 second-feet.

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Monthly discharge of Chippewa River near Watson, Minn., for the year ending Sept. 30, 1913.

[Drainage area, 1,940 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	67	57	61.5	0.032	0.04	B.
November	65	.....	58.9	.030	.03	C.
December	.....	.....	45	.023	.03	C.
January	.....	.....	23	.012	.01	D.
February	.....	.....	9	.0046	.005	D.
March	.....	.....	30	.016	.02	D.
April	240	.....	127	.066	.07	B.
May	204	124	191	.098	.11	A.
June	210	36	84.6	.044	.05	A.
July	180	34	86.5	.045	.05	A.
August	165	85	121	.062	.07	A.
September	210	71	101	.052	.06	A.
The year	304	.....	78.5	.040	.54	

REDWOOD RIVER NEAR REDWOOD FALLS, MINN.

Location.—At first highway bridge above Redwood Falls, 3 miles distant.

Records available.—July 2, 1909, to September 30, 1913.

Drainage area.—703 square miles.

Gage.—Chain gage attached to bridge; read once daily to quarter-tenths. Limits of use: Hundredths below 3.0, half-tenths from 3.0 to 4.0, and tenths above 4.0 feet.

Channel and control.—Well-defined control, consisting of loose and solid rock and coarse gravel, at rapids about 200 feet below gage; practically permanent.

Discharge measurements.—Made from bridge; at low stages by wading at different sections.

Winter flow.—Affected by ice; observations discontinued.

Regulation.—Flow natural; no dams above gaging station. Below station a dam at Redwood Falls creates a pond extending a considerable distance upstream, but backwater does not reach station.

Accuracy.—Records should be reliable as conditions are favorable for excellent results.

Discharge measurements of Redwood River near Redwood Falls, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 24	S. B. Soulé	2.32	67	Sept. 17	S. B. Soulé	1.64	2.6
July 17	B. J. Peterson	2.01	27	17	.....do	1.64	2.6

NOTE.—Measurements made by wading.

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Daily gage height, in feet, of Redwood River near Redwood Falls, Minn., for the year ending Sept. 30, 1913.

[Wallace Stuart, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.75	2.05	.....	.....	.....	.....	2.42	2.35	2.25	1.72	1.79	1.78
2	1.85	2.05	.....	.....	.....	.....	2.45	2.30	2.20	1.70	1.74	1.78
3	1.90	2.02	.....	.....	.....	.....	2.47	2.20	2.20	1.70	1.69	1.78
4	1.90	2.00	.....	.....	.....	.....	2.47	2.15	2.10	1.80	1.69	1.78
5	1.75	1.92	.....	.....	.....	.....	2.47	2.10	2.10	1.78	1.69	1.76
6	1.95	2.00	.....	.....	.....	.....	2.37	2.10	2.05	1.78	1.74	1.77
7	1.95	2.00	.....	.....	.....	.....	2.32	2.08	2.00	1.75	1.67	1.72
8	2.00	2.00	.....	.....	.....	.....	2.32	2.08	1.98	1.80	1.69	1.72
9	2.00	2.00	.....	.....	.....	.....	2.35	2.05	1.95	1.90	1.64	1.72
10	1.88	.....	.....	.....	.....	.....	2.37	2.05	1.90	2.00	1.61	1.75
11	2.00	1.95	.....	.....	.....	.....	2.37	2.05	1.90	2.10	1.59	1.72
12	2.10	2.00	.....	.....	.....	.....	2.37	2.02	1.90	2.10	1.59	1.69
13	2.10	2.00	.....	.....	.....	.....	2.37	2.02	1.90	2.10	1.59	1.67
14	2.00	1.95	.....	.....	.....	.....	2.39	2.05	1.88	2.10	1.69	1.67
15	1.85	1.90	.....	.....	.....	.....	2.47	2.10	1.90	2.08	1.69	1.67
16	1.95	2.00	.....	.....	.....	.....	2.49	2.05	1.85	2.05	1.69	1.67
17	1.95	1.95	.....	.....	.....	.....	2.52	2.02	1.85	2.00	1.73	1.65
18	2.00	1.95	.....	.....	.....	.....	2.57	2.02	1.85	.....	1.76	1.65
19	2.10	1.95	.....	.....	.....	.....	2.62	2.08	1.82	1.95	1.68	1.62
20	1.95	1.90	.....	.....	.....	.....	2.57	2.08	1.80	1.90	1.68	1.62
21	2.00	1.98	.....	.....	.....	.....	2.47	2.10	1.80	1.90	1.73	1.60
22	2.05	2.00	.....	.....	.....	.....	2.47	2.10	1.78	1.90	1.73	1.60
23	2.05	2.00	.....	.....	.....	.....	2.32	2.12	1.80	1.90	1.73	1.65
24	2.05	1.98	.....	.....	.....	.....	2.27	2.15	1.80	1.88	1.78	1.65
25	1.90	1.90	.....	.....	.....	.....	2.40	2.20	1.80	1.85	1.78	1.65
26	1.96	1.98	.....	.....	.....	.....	2.40	2.25	1.80	1.82	1.78	1.65
27	2.05	1.95	.....	.....	.....	.....	2.38	2.30	1.78	1.79	1.78	1.62
28	2.00	1.98	.....	.....	.....	.....	2.35	2.30	1.75	1.79	1.78	1.65
29	2.05	2.00	.....	.....	.....	.....	2.35	2.30	1.78	1.79	1.78	1.62
30	1.96	1.88	.....	.....	.....	.....	2.30	2.25	1.78	1.79	1.78	1.60
31	2.00	.....	.....	.....	.....	.....	.....	2.30	.....	1.79	1.78	.....

NOTE.—Discharge relation affected by ice about Dec. 1, 1912, to Mar. 31, 1913.

Daily discharge, in second-feet, of Redwood River near Redwood Falls, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	8.5	32	.....	.....	.....	.....	97	80	60	6	9	8
2	14	32	.....	.....	.....	.....	104	69	50	5	7	8
3	17	29	.....	.....	.....	.....	110	50	50	5	5	8
4	17	26	.....	.....	.....	.....	110	42	34	9	5	8
5	8.5	19	.....	.....	.....	.....	110	34	34	8	5	7
6	22	26	.....	.....	.....	.....	84	34	28	8	7	8
7	22	26	.....	.....	.....	.....	73	32	23	7	4	6
8	26	26	.....	.....	.....	.....	73	32	21	9	5	6
9	26	26	.....	.....	.....	.....	80	28	19	15	3	6
10	16	[a] 24	.....	.....	.....	.....	84	28	15	23	2	7
11	26	22	.....	.....	.....	.....	84	28	15	34	2	6
12	39	26	.....	.....	.....	.....	84	25	15	34	2	5
13	39	26	.....	.....	.....	.....	84	25	15	34	2	4
14	26	22	.....	.....	.....	.....	90	28	14	34	5	4
15	14	17	.....	.....	.....	.....	110	34	15	32	5	4
16	22	26	.....	.....	.....	.....	114	28	12	28	5	4
17	22	22	.....	.....	.....	.....	122	25	12	23	6	4
18	26	22	.....	.....	.....	.....	136	25	12	[a] 21	7	4
19	39	22	.....	.....	.....	.....	150	32	10	19	4	3
20	22	17	.....	.....	.....	.....	136	32	9	15	4	3
21	26	24	.....	.....	.....	.....	110	34	9	15	6	2
22	32	26	.....	.....	.....	.....	110	34	8	15	6	2
23	32	26	.....	.....	.....	.....	73	37	9	15	6	4
24	32	24	.....	.....	.....	.....	63	42	9	14	8	4
25	17	17	.....	.....	.....	.....	92	50	9	12	8	4
26	22	24	.....	.....	.....	.....	92	60	9	10	8	4
27	32	22	.....	.....	.....	.....	87	69	8	9	8	3
28	26	24	.....	.....	.....	.....	80	69	7	9	8	4
29	32	26	.....	.....	.....	.....	80	69	8	9	8	3
30	22	16	.....	.....	.....	.....	69	60	8	9	8	2
31	26	.....	.....	.....	.....	.....	.....	69	.....	9	8	.....

[a] Estimated.

NOTE.—Daily discharge computed from a fairly well-defined rating curve. Discharge, December 1-31, 1912, estimated, because of ice, from discharge of adjacent drainage areas, at 10 second-feet.

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Monthly discharge of Redwood River near Redwood Falls, Minn., for the year ending Sept. 30, 1913.

[Drainage area, 703 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	39	8.5	24.2	0.034	0.04	B.
November	32	16	23.9	.034	.04	C.
December	.....	.....	10	.014	.02	
April	150	63	96.4	.137	.15	B.
May	80	25	42.1	.060	.07	B.
June	60	7	18.2	.026	.03	B.
July	34	5	16.0	.023	.03	B.
August	9	2	5.7	.0081	.009	C.
September	8	2	4.8	.0068	.008	C.

COTTONWOOD RIVER NEAR NEW ULM, MINN.

Location.—In sec. 31, T. 10 N., R. 30 W., at Alwin highway bridge, 2 miles southeast of New Ulm, 15 miles below mouth of Sleepy Eye Creek, the nearest tributary.

Records available.—July 2, 1909, to September 30, 1913.

Drainage area.—1,190 square miles.

Gage.—Chain gage attached to bridge; read morning and evening to quarter-tenths. Limits of use: Hundredths below 2.0, half-tenths from 2.0 to 3.5, and tenths above 3.5 feet. Datum of gage lowered 2.28 feet August 12, 1909. All readings prior to that date corrected so that all gage heights refer to new datum.

Channel and control.—Slightly shifting as shown by low-water measurements.

Discharge measurements.—Made from bridge and during extreme low water by wading.

Winter flow.—Estimates during frozen period based on discharge measurements.

Regulation.—Flow not regulated; no dams above station and no effect from backwater from dam at New Ulm.

Accuracy.—See footnote to monthly discharge table.

Discharge measurements of Cottonwood River near New Ulm, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Dec. 27	S. B. Soulé	1.93	[a] 9.7	July 18	B. J. Peterson	1.80	[b] 68
Jan. 22	....do	2.76	[a] 2.1	Sept. 18	S. B. Soulé	1.04	[b] 13.0
Apr. 24	W. G. Hoyt	2.73	229	18	.....do	1.04	[b] 12.8

[a] Complete ice cover.
[b] Measurement made by wading at a section a short distance below the gage.

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Daily gage height, in feet, of Cottonwood River near New Ulm, Minn., Oct. 1, 1912, to Dec. 13, 1913.

[Esther Alwin, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.20	1.25	.....	.....	.....	.....	3.3	2.5	2.75	2.5	1.45	1.26	1.18	1.19	1.30
2	1.20	1.25	2.0	2.0	.....	.....	3.35	2.5	2.6	2.4	1.42	1.22	1.16	1.28	1.30
3	1.18	1.25	.....	.....	.....	.....	3.35	2.5	2.55	2.3	1.42	1.20	1.15	1.30	1.30
4	1.12	1.25	.....	.....	.....	.....	3.3	2.45	2.4	2.45	1.42	1.15	1.15	1.30	1.30
5	1.10	1.25	.....	.....	.....	.....	3.3	2.45	2.15	2.3	1.42	1.10	1.12	1.30	1.30
6	1.12	1.25	.....	.....	2.95	3.1	3.15	2.4	2.1	2.3	1.42	1.05	1.10	1.30	1.30
7	1.16	1.25	.....	.....	.....	.....	2.75	2.4	1.95	2.2	1.42	1.05	1.10	1.32	1.10
8	1.18	1.25	.....	.....	.....	.....	2.1	2.35	1.92	2.1	1.42	1.09	1.10	1.35	1.40
9	1.14	1.25	2.3	2.3	.....	.....	2.2	2.25	1.82	2.1	1.42	1.12	1.10	1.08	1.40
10	1.12	1.25	.....	.....	.....	.....	2.2	2.1	1.80	2.0	1.40	1.11	1.18	1.10	1.42
11	1.12	1.25	.....	.....	.....	.....	2.25	2.05	1.75	1.98	1.38	1.10	1.15	1.10	1.42
12	1.18	1.25	.....	.....	.....	.....	2.3	2.05	1.72	1.92	1.34	1.08	1.15	1.10	1.42
13	1.26	1.25	.....	.....	3.0	5.6	2.45	1.95	1.65	1.90	1.32	1.08	1.15	1.10	1.42
14	1.28	1.25	.....	.....	.....	.....	2.65	1.95	1.78	1.90	1.32	1.06	1.15	1.10	.....
15	1.29	1.25	.....	.....	.....	.....	3.2	2.0	1.70	1.88	1.32	1.08	1.15	1.30	.....
16	1.30	1.25	2.6	2.6	.....	.....	4.3	2.05	1.49	1.85	1.32	1.08	1.15	1.30	.....
17	1.35	1.28	.....	.....	.....	.....	4.7	2.15	1.48	1.80	1.30	1.06	1.18	1.30	.....
18	1.35	1.28	.....	.....	.....	.....	4.5	2.2	1.40	1.75	1.28	1.06	1.20	1.30	.....
19	1.30	1.28	.....	.....	.....	.....	3.8	2.25	1.35	1.70	1.28	1.12	1.20	1.30	.....
20	1.28	1.28	.....	.....	3.0	3.8	3.4	2.3	1.54	1.68	1.32	1.11	1.20	1.30	.....
21	1.28	1.28	.....	.....	.....	.....	3.1	2.35	1.51	1.62	1.40	1.05	1.20	1.32	.....
22	1.28	1.28	.....	2.8	.....	.....	3.0	2.65	1.48	1.60	1.48	1.00	1.20	1.32	.....
23	1.28	1.28	2.7	2.7	.....	.....	2.95	3.05	1.48	1.58	1.52	1.02	1.20	1.32	.....
24	1.28	1.39	.....	.....	.....	.....	2.95	3.1	1.56	1.52	1.64	1.06	1.20	1.34	.....
25	1.26	1.48	.....	.....	.....	.....	3.2	3.05	1.94	1.50	1.62	1.10	1.20	1.32	.....
26	1.25	1.50	.....	.....	.....	.....	3.3	3.0	2.5	1.46	1.52	1.10	1.20	1.32	.....
27	1.25	1.50	1.93	.....	3.05	.....	3.2	3.0	3.25	1.41	1.42	1.09	1.20	1.32	.....
28	1.25	1.48	.....	.....	.....	.....	3.0	2.95	3.6	1.40	1.40	1.08	1.20	1.30	.....
29	1.25	1.48	.....	.....	.....	.....	2.9	2.9	3.2	1.40	1.35	1.12	1.28	1.30	.....
30	1.25	1.48	2.8	2.8	.....	.....	2.65	2.8	2.85	1.45	1.32	1.15	1.21	1.30	.....
31	1.25	.....	.....	.....	.....	.....	.....	2.8	.....	1.45	1.30	.....	1.28	.....	.....

NOTE.—Discharge relation affected by ice about Nov. 24, 1912, to Apr. 7, 1913, and Dec. 7–13, 1913.

Daily discharge, in second-feet, of Cottonwood River near New Ulm, Minn., Oct. 1, 1912, to Dec. 6, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	17	20	.....	.....	.....	.....	.....	174	233	174	35	22	17	18	24
2	17	20	.....	.....	.....	.....	.....	174	196	154	33	19	16	23	24
3	16	20	.....	.....	.....	.....	.....	174	185	136	33	18	16	24	24
4	13	20	.....	.....	.....	.....	.....	164	154	164	33	16	16	24	24
5	12	20	.....	.....	.....	.....	.....	164	113	136	33	14	15	24	24
6	13	20	.....	.....	.....	.....	.....	154	106	136	33	13	14	24	24
7	15	20	.....	.....	.....	.....	.....	154	86	120	33	13	14	25	.....
8	16	20	.....	.....	.....	.....	106	145	82	106	33	14	14	28	.....
9	14	20	.....	.....	.....	.....	120	128	70	106	33	15	14	14	.....
10	13	20	.....	.....	.....	.....	120	106	68	92	31	14	17	14	.....
11	13	20	.....	.....	.....	.....	128	99	63	90	30	14	16	14	.....
12	16	20	.....	.....	.....	.....	136	99	60	82	27	14	16	14	.....
13	21	20	.....	.....	.....	.....	164	86	53	80	25	14	16	14	.....
14	23	20	.....	.....	.....	.....	208	86	66	80	25	13	16	14	.....
15	23	20	.....	.....	.....	.....	370	92	58	78	25	14	16	24	.....
16	24	20	.....	.....	.....	.....	830	99	38	74	25	14	16	24	.....
17	28	23	.....	.....	.....	.....	1,010	113	37	68	24	13	17	24	.....
18	28	23	.....	.....	.....	.....	920	120	31	63	23	13	18	24	.....
19	24	23	.....	.....	.....	.....	605	128	28	58	23	15	18	24	.....
20	23	23	.....	.....	.....	.....	445	136	43	56	25	14	18	24	.....
21	23	23	.....	.....	.....	.....	336	145	40	50	31	13	18	25	.....
22	23	23	.....	.....	.....	.....	304	208	37	48	37	12	18	25	.....
23	23	23	.....	.....	.....	.....	289	320	37	46	41	12	18	25	.....
24	23	.....	.....	.....	.....	.....	289	336	44	41	52	13	18	27	.....
25	21	.....	.....	.....	.....	.....	370	320	85	39	50	14	18	25	.....
26	20	.....	.....	.....	.....	.....	406	304	174	36	41	14	18	25	.....
27	20	.....	.....	.....	.....	.....	370	304	388	32	33	14	18	25	.....
28	20	.....	.....	.....	.....	.....	304	289	525	31	31	14	18	24	.....
29	20	.....	.....	.....	.....	.....	274	274	370	31	28	15	23	24	.....
30	20	.....	.....	.....	.....	.....	208	246	260	35	25	16	19	24	.....
31	20	.....	.....	.....	.....	.....	.....	246	.....	35	24	.....	23	.....	.....

NOTE.—Daily discharge computed from two well-defined rating curves. Curve used Apr. 8 to Dec. 6, 1913, based on measurements made during that period. Discharge estimated, because of ice, from gage heights, observer's notes, 2 discharge measurements, and climatic records, as follows: Nov. 24–30, 23 second-feet; Dec. 1–26, 16 second-feet; Dec. 27–31, 1912, 10 second-feet; Jan. 1–31, 1913, 4 second-feet; Feb. 1–28, 3 second-feet; Mar. 1–31, 50 second-feet; and Apr. 1–7, 70 second-feet.

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Monthly discharge of Cottonwood River near New Ulm, Minn., Oct. 1, 1911, to Dec. 6, 1913.

[Drainage area, 1,190 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1911-12.						
October	679	26	279	0.234	0.27	C.
November	116	.....	60.9	.051	.06	D.
December	.....	.....	55.0	.046	.05	D.
January	.....	.....	20	.017	.02	D.
February	.....	.....	15	.013	.01	D.
March	.....	.....	90	.076	.09	C.
April	.....	.....	233	.196	.22	C.
May	250	68	123	.103	.12	B.
June	97	24	51.0	.043	.05	B.
July	91	15	31.0	.026	.03	B.
August	50	12	23.6	.020	.02	C.
September	23	10	15.8	.013	.01	C.
The year	679	.....	83.4	.070	.95	
1912-13.						
October	28	12	19.4	.016	.02	C.
November	.....	.....	21.4	.018	.02	C.
December	.....	.....	15	.013	.01	C.
January	.....	.....	4	.0034	.004	D.
February	.....	.....	3	.0025	.003	D
March	.....	.....	50	.042	.05	D.
April	1,010	.....	293	.246	.27	C.
May	336	86	180	.151	.17	B.
June	525	28	124	.104	.12	B.
July	174	31	79.9	.067	.08	A.
August	52	23	31.5	.026	.03	B.
September	22	12	14.4	.012	.01	A.
The year	1,010	.....	69.8	.059	.79	
1913.						
October	23	14	17.1	.014	.02	B.
November	28	14	22.2	.019	.02	B.
December 1-6	24	24	24	.020	.004	B.

NOTE.—Estimates of "Discharge in second-feet per square mile" and "Run-off (depth in inches)" for 1912 supersede those published in Water-Supply Paper 325, which were computed from an erroneous value of the drainage area. Estimates for October, November, and December, 1911, are republished to complete the data for the climatic year.

ST. CROIX RIVER NEAR ST. CROIX FALLS, WIS.

Location.—At power plant of Minneapolis General Electric Co., on Wisconsin side of St. Croix River near St. Croix Falls, Wis., about 50 miles above confluence of St. Croix and Mississippi rivers near Hastings, Minn. Apple River, draining an area wholly in Wisconsin, enters from left about 20 miles below station; Snake River enters from right about 35 miles above station.

Records available.—January 10, 1902, to June 30, 1905; January 1, 1910, to September 30, 1913. Data for 1903 published in Water-Supply Paper 98, pages 176–177, under St. Croix River, near Taylors Falls, Minn. Daily and monthly discharge for January 10, 1902, to June 30, 1905, and January 1, 1910, to October 31, 1912, and monthly discharge for July, 1905, to December, 1909, with the exception of nine months, published also in report on water resources of Minnesota by the State Drainage Commission.

Drainage area.—5,930 square miles.

Discharge.—Determinations based on kilowatt output of dynamo and exciters plus the flow over the dam and spillway, which are considered as a weir.

Accuracy.—Records not checked by engineers of United States Geological Survey, but are believed reliable.

Cooperation.—Records furnished by Minneapolis General Electric Co.

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Daily discharge, in second-feet, of St. Croix River near St. Croix Falls, Wis., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,830	1,790	1,610	760	1,420	1,630	3,190	4,940	2,500	3,030	3,480	2,410
2	1,760	1,920	1,540	1,270	1,170	1,020	3,280	4,470	3,980	1,450	3,160	2,680
3	1,600	1,510	1,350	1,590	1,410	1,400	5,060	4,080	6,400	2,060	2,390	3,490
4	1,780	1,630	1,940	1,670	1,340	1,270	5,890	4,480	6,260	1,260	3,420	3,260
5	1,960	1,520	1,920	1,250	1,190	1,120	6,370	5,480	4,630	1,240	3,380	3,050
6	1,530	1,780	1,740	1,200	1,210	1,220	6,580	4,580	3,240	1,230	3,150	2,910
7	1,340	1,630	1,360	1,270	1,160	1,280	7,190	3,610	3,200	2,820	3,380	1,790
8	2,360	1,740	1,070	1,480	1,400	1,440	8,420	4,810	1,700	3,320	3,070	2,780
9	2,060	1,750	1,360	1,190	1,200	935	8,610	3,790	3,020	3,260	3,130	2,860
10	1,740	1,590	1,190	1,560	1,250	1,360	7,460	3,870	3,370	3,350	1,660	2,730
11	1,750	1,770	1,260	1,440	1,230	1,640	7,020	3,990	3,380	3,320	2,420	2,680
12	1,960	1,600	1,240	1,190	1,140	1,690	6,160	3,470	3,340	3,160	2,860	2,610
13	1,690	1,590	1,230	1,500	1,130	2,240	5,470	3,290	3,070	2,290	2,790	2,560
14	2,020	1,660	1,430	1,300	1,140	2,520	5,900	3,520	2,880	4,410	2,450	1,560
15	2,090	1,560	1,650	1,230	1,320	2,590	6,290	3,080	1,700	4,560	1,910	2,580
16	2,100	1,740	1,440	1,380	1,070	1,270	6,270	3,120	2,730	5,450	2,440	2,830
17	2,090	1,340	1,680	1,130	1,280	971	6,950	4,410	2,520	4,380	1,540	2,740
18	2,060	1,640	1,530	1,820	1,190	1,900	5,400	3,100	2,400	6,030	2,440	2,670
19	2,000	1,560	1,410	1,120	1,160	1,800	6,100	4,950	2,500	6,200	2,500	2,200
20	1,840	1,630	1,610	1,450	1,330	2,060	6,220	6,870	2,310	5,620	2,530	2,600
21	1,900	1,630	1,790	1,260	1,310	1,990	6,120	6,550	2,410	5,230	2,550	1,550
22	1,720	1,630	1,440	1,310	1,430	2,570	5,990	8,980	1,570	4,280	2,750	1,910
23	1,830	1,720	1,350	1,340	1,150	1,330	5,780	8,590	2,350	3,420	2,660	2,060
24	1,750	1,460	1,850	1,310	1,350	1,800	7,000	8,560	2,600	3,670	1,620	2,880
25	1,840	1,520	1,220	1,500	1,270	1,830	7,500	6,290	2,070	3,950	2,620	1,730
26	2,080	876	1,790	1,140	1,380	1,730	7,120	6,780	2,100	3,660	2,670	2,550
27	1,580	1,190	1,500	1,280	1,280	2,230	8,640	5,480	1,830	1,830	3,040	2,530
28	1,700	1,300	1,690	1,320	1,280	1,850	8,350	5,090	2,010	3,080	3,260	1,660
29	1,800	949	1,480	1,260	.....	2,590	6,520	4,380	1,490	3,600	3,340	2,760
30	1,760	1,350	1,450	1,300	.....	1,420	6,140	3,600	3,100	3,720	3,350	2,740
31	1,710	.....	1,100	1,340	.....	2,560	.....	3,510	.....	3,910	2,010	.....

Monthly discharge of St. Croix River near St. Croix Falls, Wis., for the year ending Sept. 30, 1913.

[Drainage area, 5,930 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).
	Maximum.	Minimum.	Mean.	Per square mile.	
October	2,360	1,340	1,850	0.312	0.36
November	1,920	876	1,550	.261	.29
December	1,940	1,070	1,490	.251	.29
January	1,820	760	1,330	.224	.26
February	1,430	1,070	1,260	.212	.22
March	2,590	935	1,720	.290	.33
April	8,640	3,190	6,430	1.08	1.20
May	8,980	3,080	4,890	.825	.95
June	6,400	1,490	2,890	.487	.54
July	6,200	1,230	3,510	.592	.68
August	3,490	1,540	2,710	.457	.53
September	3,490	1,550	2,510	.423	.47
The year	8,980	760	2,680	.452	6.12

NOTE.—Computed by engineers of the United States Geological Survey from records of daily discharge furnished by the Minneapolis General Electrical Co.

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KETTLE RIVER NEAR SANDSTONE, MINN.

Location.—At quarries of Barber Asphalt Co. at Banning, 3 miles above Sandstone; no tributaries within several miles.

Records available.—October 18, 1908, to September 30, 1913.

Drainage area.—825 square miles.

Gage.—Staff gage in two sections fastened to vertical rock wall; read once daily to half-tenths. Limits of use: Half-tenths below and tenths above 3.5 feet. Gage 50 feet above decided rapids. Datum subsequent to April 25, 1912, may differ not more than about 0.02 foot from that of previous years.

Channel and control.—Bedrock; permanent.

Winter flow.—Rapids freeze and cause backwater during extremely cold weather.

Regulation.—Station not affected by nearest dam at Sandstone, 3 miles below.

Cooperation.—Station maintained in cooperation with Kettle River Co.

No discharge measurements were made during the year ending September 30, 1913.

Daily gage height, in feet, of Kettle River near Sandstone, Minn., for the year ending Sept. 30, 1913.

[F. L. Betts, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.35	1.3	.....	1.2	.....	.....	2.2	3.4	3.2	2.3	2.7	1.7
2	1.3	1.3	.....	1.2	.....	.....	2.7	3.3	3.1	2.2	2.7	1.7
3	1.25	1.3	.....	1.25	.....	.....	2.95	3.2	3.1	2.2	2.6	1.6
4	1.2	1.3	.....	1.25	.....	.....	2.9	3.3	3.0	2.2	2.5	1.6
5	1.3	1.3	.....	.....	.....	.....	2.8	3.3	3.0	3.9	2.4	1.6
6	1.3	1.3	.....	.....	1.0	1.05	2.9	3.2	2.9	4.7	2.3	1.5
7	1.35	1.3	.....	.....	.....	.....	3.15	3.1	2.9	4.9	2.2	1.5
8	1.3	1.3	.....	.....	.....	.....	3.2	3.0	2.8	4.7	2.2	1.4
9	1.25	1.3	.....	1.4	.....	.....	3.25	2.8	2.8	4.7	2.1	1.4
10	1.2	1.3	.....	.....	.....	.....	3.15	2.8	2.7	4.7	2.0	1.4
11	1.25	1.3	.....	.....	.....	.....	3.05	2.7	2.7	4.7	1.9	1.5
12	1.5	1.3	.....	.....	.....	.....	2.95	2.7	2.6	4.6	1.9	2.1
13	1.45	1.3	.....	.....	1.0	.....	3.1	2.6	2.5	4.6	1.8	2.1
14	1.4	1.3	.....	.....	.....	.....	3.7	2.6	2.4	4.5	1.7	2.1
15	1.4	1.3	.....	.....	.....	.....	3.7	2.8	2.3	4.4	1.7	2.1
16	1.35	1.3	.....	1.3	.....	1.0	3.7	3.4	2.3	4.3	1.8	2.0
17	1.35	1.25	.....	.....	.....	1.0	3.6	5.1	2.3	4.3	2.0	2.0
18	1.35	1.2	.....	.....	.....	.95	3.5	5.0	2.2	4.2	2.2	1.9
19	1.35	1.2	.....	.....	.....	1.0	3.5	4.8	2.1	4.2	2.2	1.9
20	1.35	1.15	.....	.....	1.0	1.05	3.4	4.6	2.0	4.0	2.1	1.8
21	1.35	1.1	.....	.....	.....	1.0	3.3	4.9	1.9	4.0	2.1	1.8
22	1.35	1.05	.....	.....	.....	1.05	3.3	5.2	1.9	3.8	2.1	1.7
23	1.3	1.0	.....	1.2	.....	1.0	3.4	5.3	1.9	3.6	2.0	1.7
24	1.3	1.0	.....	.....	.....	1.0	3.7	5.0	1.8	3.4	2.0	1.7
25	1.3	.95	.....	.....	.....	1.05	4.0	4.6	1.8	3.2	2.0	1.8
26	1.25	.9	.....	.....	1.0	1.1	4.2	4.3	2.3	3.1	1.9	1.9
27	1.3	.8	.....	.....	.....	1.25	4.3	3.9	2.4	3.0	1.9	1.9
28	1.3	.8	.....	.....	.....	1.15	4.3	3.8	2.3	3.0	1.9	1.9
29	1.3	.75	.....	.....	.....	1.1	3.9	3.6	2.3	2.9	1.8	1.9
30	1.3	.7	.....	1.0	.....	1.3	3.5	3.6	2.3	2.9	1.8	1.9
31	1.3	.....	.....	.....	.....	1.65	.....	3.4	.....	2.8	1.8	.....

NOTE.—Discharge relation affected by ice about Dec. 1, 1912, to Mar. 15, 1913.

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Daily discharge, in second-feet, of Kettle River near Sandstone, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	124	112	.....	.....	.....	.....	420	1,170	1,010	465	675	216
2	112	112	.....	.....	.....	.....	675	1,090	935	420	675	216
3	101	112	.....	.....	.....	.....	832	1,010	935	420	620	186
4	90	112	.....	.....	.....	.....	800	1,090	865	420	565	186
5	112	112	.....	.....	.....	.....	735	1,090	865	1,610	515	186
6	112	112	.....	.....	.....	.....	800	1,010	800	2,440	465	160
7	124	112	.....	.....	.....	.....	972	935	800	2,730	420	160
8	112	112	.....	.....	.....	.....	1,010	865	735	2,440	420	136
9	101	112	.....	.....	.....	.....	1,050	735	735	2,440	375	136
10	90	112	.....	.....	.....	.....	972	735	675	2,440	330	136
11	101	112	.....	.....	.....	.....	900	675	675	2,440	288	160
12	160	112	.....	.....	.....	.....	832	675	620	2,320	288	375
13	148	112	.....	.....	.....	.....	935	620	565	2,320	250	375
14	136	112	.....	.....	.....	.....	1,430	620	515	2,200	216	375
15	136	112	.....	.....	.....	.....	1,430	735	465	2,090	216	375
16	124	112	.....	.....	.....	52	1,430	1,170	465	1,990	250	330
17	124	101	.....	.....	.....	52	1,340	3,000	465	1,990	330	330
18	124	90	.....	.....	.....	44	1,260	2,860	420	1,890	420	288
19	124	90	.....	.....	.....	52	1,260	2,580	375	1,890	420	288
20	124	80	.....	.....	.....	61	1,170	2,320	330	1,700	375	250
21	124	70	.....	.....	.....	52	1,090	2,720	288	1,700	375	250
22	124	61	.....	.....	.....	61	1,090	3,160	288	1,520	375	216
23	112	52	.....	.....	.....	52	1,170	3,300	288	1,340	330	216
24	112	52	.....	.....	.....	52	1,430	2,860	250	1,170	330	216
25	112	44	.....	.....	.....	61	1,700	2,320	250	1,010	330	250
26	101	37	.....	.....	.....	70	1,890	1,990	465	935	288	288
27	112	24	.....	.....	.....	101	1,990	1,610	515	865	288	288
28	112	24	.....	.....	.....	80	1,990	1,520	465	865	288	288
29	112	18	.....	.....	.....	70	1,610	1,340	465	800	250	288
30	112	12	.....	.....	.....	112	1,260	1,340	465	800	250	288
31	112	.....	.....	.....	.....	201	.....	1,170	.....	735	250	.....

NOTE.—Daily discharge computed from a well-defined rating curve. Discharge estimated, because of ice, from gage heights, observer's notes, climatic records, and discharge of Rum and Snake Rivers, as follows: Dec. 1–31, 80 second-feet; Jan. 1–31, 60 second-feet; Feb. 1–28, 40 second-feet; and Mar. 1–15, 50 second-feet.

Monthly discharge of Kettle River near Sandstone, Minn., for the year ending Sept. 30, 1913.

[Drainage area, 825 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	160	90	117	0.142	0.16	B.
November	112	12	84.9	.103	.11	C.
December	.....	.....	80	.097	.11	D.
January	.....	.....	60	.073	.08	D.
February	.....	.....	40	.048	.05	D.
March	201	.....	62.0	.075	.09	C.
April	1,990	420	1,180	1.43	1.60	A.
May	3,300	620	1,560	1.89	2.18	B.
June	1,010	250	566	.686	.77	A.
July	2,720	420	1,560	1.89	2.18	A.
August	675	216	370	.448	.52	A.
September	375	136	248	.301	.34	A.
The year	3,300	.....	498	.604	8.19	

SNAKE RIVER AT MORA, MINN.

Location.—In sec. 14, T. 39 N., R. 24 W., at the highway bridge three-fourths of a mile south of Mora, above mouth of Ann River.

Records available.—June 11, 1909, to June 30, 1913, when station was discontinued in favor of a better location at Pine City.

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Drainage area.—422 square miles.

Gage.—Vertical staff; read morning and evening to tenths; occasional readings taken to quarter-tenths. Limits of use: Hundredths below 6.5, half-tenths from 6.5 to 8.0, and tenths above 8.0 feet.

Channel and control.—Shifting.

Winter flow.—Determined by measurements made through the ice.

Regulation.—Flow at station not regulated except for possible slight effect from logging dams at Knife Lake outlet and White Pine. Below Pine City flow regulated to some extent by operation of power plant at that place.

Accuracy.—Records considered only fair owing to shifting channel.

Discharge measurements of Snake River at Mora, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 24	S. B. Soulé	5.94	[a] 33	Jan. 29	S. B. Soulé	6.66	[b] 24.7
24	do	5.94	[a] 36	Feb. 26	do	6.66	[b] 21.8
Dec. 31	do	6.41	[b] 31	Apr. 18	do	7.08	203
Jan. 29	do	6.66	[b] 24.5	May 22	W. G. Hoyt	11.19	1,680

[a] Measurement made by wading. [b] Complete ice cover at control.

Daily gage height, in feet, of Snake River at Mora, Minn., for the period Oct. 1, 1912, to June 30, 1913.

[Alice Lasher, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	6.05	5.92	5.95	.....	.....	.....	9.2	7.8	7.55
2	6.00	5.95	.....	6.3	.....	.....	9.0	7.75	7.4
3	6.00	5.92	.....	.....	.....	.....	8.9	7.65	7.2
4	6.00	5.92	.....	.....	.....	.....	8.8	7.65	7.0
5	5.95	5.95	5.95	.....	.....	6.8	8.4	7.65	6.9
6	5.90	5.94	.....	.....	6.5	.....	8.1	7.55	6.75
7	5.91	5.92	.....	.....	.....	.....	7.65	7.45	6.65
8	5.90	5.92	.....	.....	.....	.....	7.45	7.35	6.6
9	5.91	5.92	.....	6.4	.....	.....	7.25	7.35	6.5
10	5.92	5.92	.....	.....	.....	.....	7.05	7.25	6.46
11	5.90	5.92	.....	.....	.....	.....	6.85	7.05	6.37
12	6.10	5.92	6.1	.....	.....	.....	6.85	7.0	6.27
13	6.05	5.92	.....	.....	6.75	7.3	6.95	6.95	6.21
14	6.00	5.90	.....	.....	.....	.....	7.05	7.05	6.16
15	6.00	5.92	.....	.....	.....	.....	7.1	7.35	6.16
16	6.00	5.95	.....	6.8	.....	.....	7.05	9.1	6.11
17	6.00	5.88	.....	.....	.....	.....	7.05	10.2	6.06
18	6.00	5.90	.....	.....	.....	.....	7.05	10.7	6.06
19	6.00	5.90	.....	.....	.....	.....	7.05	10.2	6.06
20	5.98	5.90	6.5	.....	7.0	6.95	7.1	9.9	6.06
21	5.95	5.91	.....	.....	.....	.....	7.05	10.2	6.06
22	6.00	5.90	.....	.....	.....	.....	7.1	11.1	6.06
23	6.00	5.90	.....	6.6	.....	.....	7.2	11.0	5.98
24	5.95	6.08	.....	.....	.....	.....	7.5	10.8	5.96
25	5.95	6.00	.....	.....	.....	.....	8.2	10.0	5.96
26	5.95	6.00	6.48	.....	6.7	.....	8.8	9.6	5.96
27	5.95	.....	.....	.....	6.65	6.95	8.6	9.1	5.98
28	5.95	.....	.....	.....	.....	.....	8.6	8.6	5.96
29	5.94	.....	.....	6.7	.....	.....	8.2	8.2	5.96
30	5.91	.....	.....	6.7	.....	.....	8.0	7.95	5.96
31	5.91	.....	6.41	.....	.....	.....	.....	7.9	.....

NOTE.—Discharge relation affected by ice about Nov. 24, 1912, to Apr. 13, 1913.

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Daily discharge, in second-feet, of Snake River at Mora, Minn., for the period Oct. 1, 1912, to June 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.
1	43	34						392	322
2	40	36						378	282
3	40	34						350	232
4	40	34						350	190
5	36	36						350	172
6	33	35						322	146
7	34	34						295	130
8	33	34						289	122
9	34	34						289	108
10	34	34						244	103
11	33	34						200	91
12	47	34						190	79
13	43	34						181	72
14	40	33					200	200	67
15	40	34					210	269	67
16	40	36					200	820	61
17	40	32					200	1,260	56
18	40	33					200	1,460	56
19	40	33					200	1,260	56
20	38	33					210	1,140	56
21	36	34					200	1,260	56
22	40	33					210	1,640	56
23	40	33					232	1,590	48
24	36						308	1,500	46
25	36						510	1,180	46
26	36						710	1,020	46
27	36						640	820	48
28	36						640	640	46
29	35						510	510	46
30	34						450	435	46
31	34							420	

NOTE.—Daily discharge computed from a fairly well-defined rating curve. Discharge estimated, because of ice, from gage heights, observer's notes, discharge measurements, and climatic records, as follows: Nov. 24–30, 33 second-feet; Dec. 1–31, 32 second-feet; Jan. 1–31, 28 second-feet; Feb. 1–28, 23 second-feet; Mar. 1–31, 35 second-feet; and Apr. 1–13, 120 second-feet.

Monthly discharge of Snake River at Mora, Minn., for the year ending Sept. 30, 1913.

[Drainage area, 422 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	47	33	37.6	0.089	0.10	B.
November			33.7	.080	.09	B.
December			32	.076	.09	C.
January			28	.066	.08	C.
February			23	.055	.06	C.
March			35	.083	.10	C.
April	710		246	.583	.65	C.
May	1,640	181	684	1.62	1.87	B.
June	322	46	98.4	.223	.26	C.

SNAKE RIVER NEAR PINE CITY, MINN.

Location.—At the Changwatana power station of the Eastern Minnesota Power Co., about 2 miles below Pine City.

Records available.—June 26 to September 30, 1913.

Drainage area.—915 square miles.

Gage.—Staff gage attached to stone retaining wall in front of power plant; read about eight times daily to hundredths.

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Channel and control.—Bed of stream rock and coarse cobblestones; control practically permanent.

Discharge measurements.—At low and medium stages made by wading at the gage; at high stages from a bridge about 1,800 feet above the gage.

Determination of flow.—Estimates made by adding to the flow through the turbines the flow over the crest of the dam as determined from readings of the staff gage. (See "Gage.") Flow through turbines determined from gate openings and head, which are read hourly.

Regulation.—Power plant at station operated with a varying light and power load which at low stages produces a decided fluctuation in discharge.

Accuracy.—Conditions favorable for estimating the waste by means of the river gage; estimates of flow through the wheels probably not so good, but, in view of the fact that they are based upon 24 readings of gate openings daily, it is believed that the records should be fair to good with the accuracy increasing with the stage.

Cooperation.—The station is maintained in cooperation with the Eastern Minnesota Power Co.

Daily discharge, in second-feet, of Snake River near Pine City, Minn., for the year ending Sept. 30, 1913.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1	.....	100	322	517	16	.....	412	180	175
2	.....	97	295	479	17	.....	449	108	252
3	.....	90	268	418	18	.....	486	199	238
4	.....	53	272	380	19	.....	461	219	213
5	.....	115	265	333	20	.....	447	211	275
6	.....	89	164	332	21	.....	488	266	204
7	.....	186	119	314	22	.....	434	342	241
8	.....	215	228	331	23	.....	388	414	190
9	.....	223	218	285	24	.....	335	474	235
10	.....	227	127	272	25	.....	322	654	250
11	.....	274	213	267	26	113	332	728	234
12	.....	309	200	251	27	109	279	750	223
13	.....	292	186	228	28	102	281	766	168
14	.....	256	188	190	29	46	332	713	190
15	.....	265	129	258	30	102	322	634	230
					31	.....	330	524	.....

Monthly discharge of Snake River near Pine City, Minn., for the year ending Sept. 30, 1913.

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
June 26–30	113	46	94.4	0.103	0.02	B.
July	488	53	287	.314	.36	B.
August	766	108	335	.366	.42	B.
September	517	168	272	.297	.33	B.

CANNON RIVER AT WELCH, MINN.

Location.—At highway bridge at Welch, just below a very small tributary and 3 miles above mouth of Belle Creek.

Records available.—June 7, 1909, to September 30, 1913.

Drainage area.—1,290 square miles.

Gage.—Chain gage attached to bridge; read morning and evening to quarter-tenths. Limits of use: Hundredths below 5.5, half-tenths from 5.5 to 7.0, and tenths above 7.0 feet.

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Channel and control.—Practically permanent.

Discharge measurements.—Made from the bridge; measurements corrected for angle of current.

Winter flow.—Determined by measurements made through the ice.

Regulation.—Flow regulated to a greater or less extent by each of the 11 developed power plants above station; also by dam at outlet of Cannon Lake.

Maximum flow.—In April, 1888, the high water reached the eaves of the wheelhouse at the mill, 20.1 feet above datum of present gage. It is said that this high water was not caused by ice gorging.

Accuracy.—Records only fair owing to daily fluctuation caused by operation of power plants.

Discharge measurements of Cannon River at Welch, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 23	W. G. Hoyt	5.66	217	Apr. 10	W. G. Hoyt	6.09	363
Feb. 3	S. B. Soulé	5.34	a 102	Sept. 10	S. B. Soulé	5.56	199
Mar. 7	....do	6.41	a 245				

a Complete ice cover.

Daily gage height, in feet, of Cannon River at Welch, Minn., for the year ending Sept. 30, 1913.

[Esther Norell, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	5.40	5.48	5.40	.....	.....	.....	7.2	5.9	5.6	5.55	5.6	5.65
2	5.44	5.65	5.5	5.35	.....	.....	6.75	5.85	5.7	5.65	5.6	5.5
3	5.44	5.49	5.6	.....	5.34	.....	6.35	6.0	5.8	5.65	5.35	5.95
4	5.52	5.31	5.7	.....	.....	.....	6.35	6.0	5.75	5.55	5.55	5.7
5	5.85	5.5	5.6	.....	.....	6.35	6.6	6.1	5.8	5.65	5.6	5.65
6	5.01	5.5	5.5	.....	5.65	.....	6.7	5.85	5.65	6.2	5.7	5.65
7	5.09	5.5	5.7	.....	.....	6.4	6.5	5.7	5.7	5.7	5.65	5.6
8	5.5	5.48	5.25	.....	.....	.....	6.25	5.75	5.32	5.85	5.6	5.7
9	5.38	5.55	5.40	5.5	.....	.....	6.15	5.8	5.41	5.95	5.6	5.8
10	5.35	5.38	5.65	.....	.....	.....	6.1	5.75	5.5	5.65	5.42	5.7
11	5.5	5.6	5.8	.....	.....	.....	6.3	5.48	5.65	5.6	5.65	5.8
12	5.7	5.6	5.75	.....	.....	.....	6.45	5.85	5.55	5.75	5.75	5.7
13	5.48	5.65	5.5	.....	6.3	5.95	6.6	5.8	5.6	5.9	5.75	5.7
14	5.40	5.5	5.65	.....	.....	.....	6.65	5.7	5.6	5.45	5.75	5.55
15	5.7	5.65	5.30	.....	.....	.....	6.55	5.75	5.65	5.7	5.7	5.65
16	5.5	5.6	5.7	5.6	.....	.....	6.3	5.8	5.26	5.6	5.55	5.65
17	5.40	5.30	5.65	.....	.....	.....	6.25	6.15	5.65	5.55	5.35	5.75
18	5.39	5.28	5.55	.....	.....	5.8	6.1	6.15	5.5	5.55	5.7	5.75
19	5.41	5.6	5.6	.....	6.5	6.1	6.1	6.3	5.65	5.6	5.9	5.75
20	5.28	5.6	5.6	.....	.....	5.75	6.0	6.6	5.20	5.40	5.7	5.8
21	5.5	5.65	5.5	.....	.....	6.1	6.15	6.85	5.6	5.5	5.8	5.47
22	5.55	5.42	5.5	.....	.....	6.2	6.0	6.95	4.81	5.55	5.85	5.7
23	5.55	5.38	5.45	5.65	.....	6.4	5.9	6.8	5.05	5.6	5.8	5.8
24	5.38	5.48	5.5	.....	.....	9.9	5.85	6.75	5.5	5.55	5.49	5.7
25	5.41	5.5	5.20	.....	.....	8.8	5.86	6.5	5.45	5.6	5.8	5.8
26	5.41	5.6	5.30	.....	6.55	7.9	5.8	6.5	5.7	5.55	5.75	5.7
27	5.30	5.65	5.55	.....	.....	7.2	5.65	6.45	5.7	5.37	5.7	5.65
28	5.5	5.7	5.5	.....	.....	7.3	5.75	6.4	5.35	5.5	5.7	5.4
29	5.44	5.35	5.25	.....	.....	7.4	5.9	6.3	5.35	5.7	5.7	5.55
30	5.48	5.6	5.20	5.8	.....	7.5	5.95	6.2	5.55	5.85	5.7	4.99
31	5.5	.....	5.40	.....	.....	7.4	.....	6.1	.....	5.8	5.7	.....

NOTE.—Discharge relation affected by ice about Dec. 1, 1912, to Mar. 17, 1913.

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Daily discharge, in second-feet, of Cannon River at Welch, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	147	165	.....	.....	.....	.....	851	294	208	195	208	222
2	156	209	.....	.....	.....	.....	631	279	236	222	208	182
3	156	168	.....	.....	.....	.....	458	324	264	222	144	309
4	175	128	.....	.....	.....	.....	458	324	250	195	195	236
5	271	170	.....	.....	.....	.....	563	359	264	222	208	222
6	78	170	.....	.....	.....	.....	608	279	222	397	236	222
7	90	170	.....	.....	.....	.....	520	236	236	236	222	208
8	170	165	.....	.....	.....	.....	417	250	137	279	208	236
9	143	182	.....	.....	.....	.....	378	264	159	309	208	264
10	136	143	.....	.....	.....	.....	359	250	182	222	161	236
11	170	195	.....	.....	.....	.....	437	177	222	208	222	264
12	223	195	.....	.....	.....	.....	499	279	195	250	250	236
13	165	209	.....	.....	.....	.....	563	264	208	294	250	236
14	147	170	.....	.....	.....	.....	586	236	208	169	250	195
15	223	209	.....	.....	.....	.....	542	250	222	236	236	222
16	170	195	.....	.....	.....	.....	437	264	123	208	195	222
17	147	126	.....	.....	.....	.....	417	378	222	195	144	250
18	145	122	.....	.....	.....	264	359	378	182	195	236	250
19	149	195	.....	.....	.....	359	359	437	222	208	294	250
20	122	195	.....	.....	.....	250	324	563	110	156	236	264
21	170	209	.....	.....	.....	359	378	678	208	182	264	174
22	182	152	.....	.....	.....	397	324	726	47	195	279	236
23	182	143	.....	.....	.....	478	294	654	82	208	264	264
24	143	165	.....	.....	.....	2,710	279	631	182	195	179	236
25	149	170	.....	.....	.....	1,850	279	520	169	208	264	264
26	149	195	.....	.....	.....	1,240	264	520	236	195	250	236
27	126	209	.....	.....	.....	851	222	499	236	149	236	222
28	170	223	.....	.....	.....	903	250	478	144	182	236	177
29	156	136	.....	.....	.....	956	294	437	144	236	236	195
30	165	195	.....	.....	.....	1,010	309	397	195	279	236	72
31	170	.....	.....	.....	.....	956	.....	359	.....	264	236	.....

NOTE.—Daily discharge computed from two fairly well defined rating curves. Rating curve used prior to Mar. 18, 1913, revised on basis of discharge measurements made subsequent to that date. Discharge estimated, because of ice, from gage heights, observer's notes, discharge measurements, and climatic records, as follows: Dec. 1–31, 170 second-feet; Jan. 1–31, 100 second-feet; Feb. 1–28, 110 second-feet; and Mar. 1–17, 247 second-feet.

Monthly discharge of Cannon River at Welch, Minn., for the year ending Sept. 30, 1913.

[Drainage area, 1,290 square miles.]

Month.	Discharge in second-feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
October	271	78	160	B.
November	223	122	176	B.
December	.....	.....	170	C.
January	.....	.....	100	D.
February	.....	.....	110	C.
March	2,710	.....	541	C.
April	851	222	422	B.
May	726	177	387	B.
June	264	47	190	B.
July	397	149	223	B.
August	294	144	226	B.
September	309	72	227	B.
The year	2,710	47	245	

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CHIPPEWA RIVER AT CHIPPEWA FALLS, WIS.

Location.—At highway bridge at Chippewa Falls, Wis., 2,500 feet below mouth of Duncan Creek entering from the right.

Records available.—June 22, 1888, to September 30, 1913. The gage was originally established by the Chippewa Lumber & Boom Co., which has kept a continuous record since 1899. Since 1904 the United States Weather Bureau has obtained gage heights during the flood season of each year. On June 1, 1906, the United States Geological Survey began making discharge measurements and obtained gage heights when no record was obtained by the Weather Bureau. Gage heights as published have been obtained from the following sources: Fargo Engineering Co., from certified blue-print copies of records kept by the Chippewa Lumber & Boom Co., June 22, 1888, to November 21, 1899; United States Weather Bureau, March to September, 1905, 1907, 1908; April to July, 1909; Chippewa Lumber & Boom Co., October 1 to December 31, 1911; United States Geological Survey. Gage read from January to June, 1912, by Chippewa Lumber & Boom Co.; March to July, 1912, by United States Weather Bureau; December, 1912, by Chippewa Valley Railway, Light & Power Co. For the period March to June, covered by two records, the mean has been used.

Drainage area.—5,600 square miles (revised since last report).

Gage.—Staff gage painted on one of the cylindrical piers at right end of bridge; graduated to feet and inches but published to feet and tenths; read morning and evening to hundredths. Limits of use: Half-tenths below 2.0 feet. On August 19, 1913, gage was found in error by the following amounts, the gage reading too high:

Point on gage.		Error.
Ft.	*in.*	*Foot.*
27	3.1	+0.03
26	4.2	+ .03
16	10.2	+ .12
12	0	+ .15
7	1	+ .12
2	2	+ .12

No corrections have been applied to gage heights published in the following table, as error has probably existed ever since gage was painted on the pier; date unknown. It should be noted that any error in the gage enters also into the gage heights of discharge measurements.

Channel and control.—Probably permanent.

Discharge measurements.—Made from downstream side of bridge.

Floods.—The river reached a stage of 26.03 feet December 6, 1896; 26.94 feet September 10, 1884, according to high-water marks on the door of the office of the Chippewa Lumber & Boom Co.; 13.5 feet September 16 and 17, 1903, according to the United States Weather Bureau.

Winter flow.—Ice forms at gage section but river is more or less open below. Notes regarding ice at gage section do not correctly indicate the extent of backwater.

Regulation.—Operation of power plant about half a mile above dam may affect flow somewhat, but greatest fluctuation is caused by operation of larger power plants above, notably the Brunet Falls Manufacturing Co., at Cornell, Wis. Operation of small reservoirs in the headwater also may affect flow somewhat.

Accuracy.—Affected somewhat by operation of power plants and during the winter by ice. Channel appears to be permanent, and a well-defined rating curve has been developed for all stages above 1.0 foot.

Cooperation.—Gage heights during 1913 furnished through courtesy of Chippewa Valley Railway, Light & Power Co.

The following discharge measurement was made by B. J. Peterson August 20, 1913: Gage height, 3.27 feet; discharge, 8,060 second-feet.

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Daily gage height, in feet, of Chippewa River at Chippewa Falls, Wis., for the years ending Sept. 30, 1888–1899.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1888.					1888.				
1	.....	3.3	2.6	1.6	16	.....	1.7	3.7	.....
2	.....	a 5.0	1.8	.....	17	.....	1.9	3.4	1.5
3	.....	2.8	2.2	1.5	18	.....	.....	3.4	1.5
4	.....	2.6	3.0	1.5	19	.....	a 8.2	.....	1.5
5	.....	2.1	.....	1.5	20	.....	.....	a 5.9	1.5
6	.....	2.5	5.2	1.5	21	.....	2.5	2.7	1.5
7	.....	2.7	5.3	1.5	22	7.8	.....	2.3	1.5
8	.....	3.0	5.1	1.5	23	7.0	1.7	2.1	.....
9	.....	3.4	5.0	.....	24	.....	1.7	2.0	2.3
10	.....	3.1	5.7	1.5	25	5.8	1.9	2.0	1.8
11	.....	a 6.7	5.3	1.5	26	5.2	1.8	.....	.....
12	.....	2.8	.....	1.5	27	4.6	1.7	1.8	1.5
13	.....	1.7	4.7	1.5	28	4.1	1.7	1.8	1.5
14	.....	1.4	4.3	1.5	29	4.0	1.7	1.8	1.3
15	.....	.....	4.1	1.5	30	3.7	2.0	1.7	.....
					31	.....	a 4.9	1.7	.....

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1888–89.												
1	1.9	.....	.....	.....	.....	.....	2.2	3.0	4.3	2.9	0.8	0.8
2	1.5	.....	.....	.....	.....	.....	2.1	3.1	1.0	3.6	.9	.9
3	1.4	.....	.....	.....	.....	.....	1.9	3.3	2.0	3.5	.8	.9
4	.8	.....	.....	.....	.....	.....	1.5	3.1	3.3	.....	.....	.9
5	1.3	.....	.....	.....	.....	.....	1.7	.....	3.9	a 6.2	.8	a 6.2
6	1.0	.....	.....	.....	.....	.....	1.8	3.3	4.2	3.9	.9	.6
7	.....	.....	.....	.....	.....	.....	.....	3.6	a 7.0	.....	.8	.5
8	1.5	.....	.....	.....	.....	.....	1.9	a 7.4	3.8	2.8	.8	.5
9	1.4	a 7.0	.....	.....	.....	.....	a 5.8	4.1	.....	.9	.7	.7
10	1.4	1.8	.....	.....	.....	.....	2.3	2.5	1.5	1.0	.8	.8
11	1.4	1.8	.....	.....	.....	.....	1.5	5.0	3.9	1.0	.....	.8
12	1.4	1.8	.....	.....	.....	.....	1.7	.....	2.8	1.8	1.0	.8
13	1.0	.....	.....	.....	.....	.....	2.0	4.6	3.1	2.1	1.0	.8
14	.....	.....	.....	.....	.....	.....	.....	a 7.8	3.0	.....	.....	.8
15	1.8	.....	.....	.....	.....	.....	2.5	4.7	3.2	a 5.2	.9	.....
16	1.5	.....	.....	.....	.....	.....	2.7	1.8	.....	2.5	.8	a 5.2
17	1.3	.....	.....	.....	.....	.....	2.4	4.5	3.9	.6	.8	1.0
18	1.0	.....	.....	.....	.....	.....	2.5	5.9	3.3	.6	.7	1.0
19	2.2	.....	.....	.....	.....	.....	2.5	.....	3.5	.8	a 3.9	.8
20	1.8	.....	.....	.....	.....	.....	a 6.6	5.9	3.8	.8	1.6	.9
21	.....	.....	.....	.....	.....	.....	3.0	a 7.7	a 6.0	.....	1.6	.9
22	1.8	.....	.....	.....	.....	.....	1.5	6.0	4.3	1.0	1.0	.....
23	1.8	.....	.....	.....	.....	.....	2.2	4.0	2.5	1.0	1.0	.9
24	1.8	.....	.....	.....	.....	.....	3.5	2.4	4.0	1.1	.9	1.0
25	1.5	.....	.....	.....	.....	.....	3.7	4.6	4.4	1.0	.....	.9
26	.....	.....	.....	.....	.....	.....	4.0	4.5	4.6	1.1	a 5.0	.8
27	.....	.....	.....	.....	.....	.....	4.4	4.2	4.6	1.0	1.5	1.0
28	.....	.....	.....	.....	.....	.....	.....	3.5	a 7.0	.6	.3	1.0
29	1.8	.....	.....	.....	.....	2.8	4.1	3.5	5.0	a 3.4	.6	.....
30	1.8	.....	.....	.....	.....	2.7	3.0	.....	.....	.6	.8	1.0
31	1.5	.....	.....	.....	.....	.....	.....	a 5.1	.....	.8	.8	.....

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Daily gage height, in feet, of Chippewa River at Chippewa Falls, Wis., for the years ending Sept. 30, 1888–1899—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1889-90.												
1	1.0	—0.2						3.2		.7	1.0	1.4
2	1.0							3.3	4.8	1.5	1.0	1.4
3	.8							3.0	4.9	2.4		.9
4	.9						3.2	2.4	4.9		.8	2.2
5	.8						2.5	a 4.2	5.3	2.1	.8	4.2
6								4.4	6.7	2.1	.8	4.6
7	.7						3.0	.8	7.0	2.0	.8	
8	.6						4.8	1.4	6.8	2.0	.8	4.7
9	.6						6.3	1.5	6.8	2.0	1.0	4.6
10	.6						6.7	a 4.7	6.0	2.0	5.5	4.2
11	.5						7.3	1.5	6.4	1.0	5.5	4.3
12	.5						8.4	.5	6.0	a 4.3	5.2	2.5
13							9.0	.8	5.8		4.8	1.4
14	.6						8.9	1.8	5.0	1.0	2.7	
15	.5						8.4	1.9		1.0	2.3	2.0
16	.6						7.2	1.8	4.1	2.2	2.9	2.0
17	.6						6.5	a 4.5	4.0	3.6		1.9
18	.5						6.5	1.7	3.4	3.2	2.1	1.9
19	.5						6.3	1.0	3.0	a 5.1	2.0	2.0
20							5.6	2.1	2.8		2.1	3.0
21	.5						5.5	3.4	2.5	1.0	3.4	4.0
22	.5						5.5	4.0		1.0	3.3	4.0
23	.5						5.3	4.6	2.1	1.0	3.0	3.5
24	.5						5.3	a 7.5	2.1	1.5		3.0
25	.4						5.0		a 4.5	1.6	2.1	2.5
26	.3						5.3	5.7	1.5	a 4.1	2.4	2.3
27							5.1	6.2	.9		2.4	a 5.5
28	.3						4.4	5.0	.9	1.0	2.4	
29	.0						4.4	5.0		1.0	a 3.6	1.8
30	.0						3.6	4.4	.7	1.0	2.9	1.1
31	.0							a 6.9		1.0		
1890-91.												
1	1.4	1.1						5.6	.5	1.3	.0	.0
2	1.4	1.1						4.6	1.0	1.4		.4
3	1.2	1.1							1.1	1.4	.5	.3
4	1.2	1.0						4.0	1.6	1.0	.9	— .3
5	1.2	2.3						a 4.6	2.0	1.1	.9	— .3
6	1.2	1.7						3.5	1.4	1.1	.8	a 2.3
7	1.0	1.1						2.3		.9	.7	.4
8	1.1	.8						1.6	1.9	.9	.9	.0
9	1.0							2.5	1.9	.9		.0
10	1.0	.7						2.5	1.9	.9	.4	.0
11	.8							2.5	2.0	a 4.8	.4	.0
12								2.4	2.3		.3	.0
13	1.4						3.3	a 6.4	2.5	.0	.3	
14	3.0						4.4	1.9		.0	.3	.0
15	4.6						5.5	2.1	2.0	.0	.0	.0
16	4.8						6.1	1.5	2.1	.0		— .1
17	a 7.1						7.3		1.8	.0	.0	— .1
18	4.6						7.4	2.5	1.9	.0	.0	— .1
19								2.3	1.6		a 1.8	.0
20	3.6						8.5	2.3	a 5.5	.0	1.0	.0
21	3.1						7.8	a 5.6		.3	.3	.0
22	2.8						7.6	1.7	.8	.3	.3	— .1
23	1.0						8.9	1.0	1.0	.9		— .1
24	1.2						9.0		.9	.9	.3	— .1
25	1.4						8.5	1.3	1.9	.9	.0	— .2
26								1.9	1.9		.3	— .2
27	2.1						7.1	1.8	1.5	.3	.3	— .2
28	1.1						6.8	1.8		.0	.3	— .2
29	1.1						5.7	a 5.5	1.4	.3	.3	— .2
30	1.3						5.5	4.9	1.3	.3		— .2
31	1.1									.0	.0	

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Daily gage height, in feet, of Chippewa River at Chippewa Falls, Wis., for the years ending Sept. 30, 1888–1899—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1891–92.												
1	−0.2	.....	.....	.....	.....	.....	1.0	.2	5.0	6.8	2.8	0.3
2	− .1	0.4	.....	.....	.....	.....	2.0	2.2	4.6	5.2	2.3	.2
3	.1	.4	.....	.....	.....	.....	5.3	3.0	4.0	6.2	2.2	.2
4	.2	.4	.....	.....	.....	.....	6.0	4.0	4.1	6.0	2.0	1.3
5	.3	.4	.....	.....	.....	.....	7.0	4.2	3.5	5.8	.8	.3
6	1.1	.4	.....	.....	.....	.....	6.7	4.5	3.3	4.8	a 5.6	.4
7	1.3	.4	.....	.....	.....	.....	7.2	4.7	4.2	4.1	.0	.3
8	.5	.....	.....	.....	.....	.....	6.5	5.1	5.5	3.2	.6	.4
9	.2	.4	.....	.....	.....	.....	5.5	4.1	5.5	3.8	.9	.5
10	.5	.4	.....	.....	.....	.....	.....	5.1	5.0	1.0	.9	.6
11	.6	.4	.....	.....	.....	.....	4.3	4.6	4.8	2.2	.9	.9
12	.8	.3	.....	.....	.....	.....	2.0	4.8	4.2	.7	1.3	1.0
13	1.0	.3	.....	.....	.....	.....	2.5	5.1	4.0	1.5	1.3	1.2
14	.9	.2	.....	.....	.....	.....	2.1	5.2	3.8	1.6	.5	.8
15	.8	.....	.....	.....	.....	.....	2.0	5.2	3.2	2.0	.7	1.2
16	.7	.2	.....	.....	.....	.....	1.9	6.2	3.4	a 6.7	.8	1.0
17	a 5.3	.....	.....	.....	.....	.....	.....	6.5	4.8	.2	.8	1.0
18	.....	.....	.....	.....	.....	.....	1.8	6.8	5.8	.5	.5	.8
19	.6	.....	.....	.....	.....	.....	1.6	6.5	5.7	1.8	.5	1.0
20	.6	.....	.....	.....	.....	.....	1.2	9.8	5.8	2.0	a 2.8	.8
21	1.2	.....	.....	.....	.....	.....	1.6	11.2	5.7	1.8	.0	.7
22	.8	.....	.....	.....	.....	.....	2.0	10.9	5.2	.8	.0	.5
23	.2	.....	.....	.....	.....	.....	a 5.9	9.8	5.0	a 6.0	.0	.5
24	.2	.....	.....	.....	.....	.....	.5	7.8	4.8	.5	.0	.5
25	.....	.....	.....	.....	.....	.....	.8	7.2	4.0	.5	.0	.2
26	.3	.....	.....	.....	.....	.....	1.0	6.6	3.3	.6	a 2.2	.3
27	.3	.....	.....	.....	.....	.....	1.1	6.2	6.9	.8	.3	.3
28	.4	.....	.....	.....	.....	.....	2.1	5.7	9.4	3.4	.2	.3
29	.4	.....	.....	.....	.....	.....	2.2	.....	9.2	4.4	.2	.3
30	.4	.....	.....	.....	.....	.....	a 5.9	5.5	8.2	4.0	.2	.3
31	a 4.8	.....	.....	.....	.....	.....	.....	5.7	.....	3.2	.2	.....
1892–93.												
1	.2	.3	.....	.....	.....	.....	.....	7.2	4.3	a 5.9	.5	.4
2	.2	.3	.....	.....	.....	.....	.....	7.5	3.7	.1	.5	.3
3	.2	.3	.....	.....	.....	.....	2.8	8.0	2.9	.2	1.1	.3
4	.2	.3	.....	.....	.....	.....	3.1	8.0	3.0	.2	.8	.3
5	.1	.3	.....	.....	.....	.....	3.7	7.3	2.9	1.2	.5	.2
6	.1	.3	.....	.....	.....	.....	4.3	6.2	3.8	1.8	.7	.4
7	.1	.3	.....	.....	.....	.....	4.4	5.3	3.6	2.1	1.5	.4
8	.1	.2	.....	.....	.....	.....	4.6	6.2	a 6.1	2.1	.8	.4
9	.0	.2	.....	.....	.....	.....	4.7	5.7	1.8	2.8	.8	.2
10	.1	.....	.....	.....	.....	.....	5.6	6.2	1.8	2.2	.4	.2
11	.1	.....	.....	.....	.....	.....	5.8	8.3	1.6	a 5.4	.5	.2
12	.1	.....	.....	.....	.....	.....	6.5	11.7	1.6	.3	.4	.2
13	.1	.....	.....	.....	.....	.....	7.6	11.8	2.5	.8	.3	.2
14	.1	.....	.....	.....	.....	.....	8.2	10.7	1.8	2.7	.3	.2
15	.1	.....	.....	.....	.....	.....	7.2	9.8	1.8	2.7	.2	.2
16	.1	.....	.....	.....	.....	.....	6.3	9.2	a 5.6	2.4	.2	.2
17	.1	.....	.....	.....	.....	.....	5.8	7.8	.0	2.3	.2	.2
18	.2	.....	.....	.....	.....	.....	5.0	7.3	.5	2.4	.2	.3
19	.2	.....	.....	.....	.....	.....	5.2	6.2	1.5	1.8	.2	.3
20	.3	.....	.....	.....	.....	.....	5.2	6.1	1.5	1.8	.2	.2
21	.3	.....	.....	.....	.....	.....	5.0	4.3	1.6	1.8	.2	.2
22	.3	.....	.....	.....	.....	.....	5.1	4.8	2.5	a 3.8	.2	.1
23	.3	.....	.....	.....	.....	.....	4.3	4.7	2.0	.5	.2	.1
24	.3	.....	.....	.....	.....	.....	3.8	5.8	a 5.7	.5	.3	.1
25	.4	.....	.....	.....	.....	.....	4.2	7.0	.0	.2	.3	.1
26	.5	.....	.....	.....	.....	.....	5.3	8.2	1.5	.2	.4	.1
27	.4	.....	.....	.....	.....	.....	7.4	7.8	2.1	.4	.4	.1
28	.3	.....	.....	.....	.....	.....	9.1	6.3	2.6	.6	.5	.1
29	.3	.....	.....	.....	.....	.....	8.8	7.2	2.6	.5	.5	.1
30	.3	.....	.....	.....	.....	.....	8.7	5.8	2.5	.5	.5	.1
31	.3	.....	.....	.....	.....	.....	.....	a 7.5	.....	.5	.5	.....

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Daily gage height, in feet, of Chippewa River at Chippewa Falls, Wis., for the years ending Sept. 30, 1888–1899—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1893–94.												
1	0.0	0.1	.....	.....	.....	.....	.....	4.5	2.9	1.2	0.0	0.2
2	.0	.....	.....	.....	.....	.....	2.7	5.5	a4.8	1.2	.3	.2
3	.0	.....	.....	.....	.....	.....	2.2	5.8	1.2	1.1	.3	.2
4	.0	.....	.....	.....	.....	.....	3.2	7.0	1.3	.8	.3	.2
5	.2	.....	.....	.....	.....	2.3	3.2	7.7	2.5	.7	.8	.2
6	.2	.....	.....	.....	.....	2.7	3.8	8.2	3.7	.7	.4	.2
7	.6	.....	.....	.....	.....	2.8	3.7	8.3	1.2	.7	.4	.2
8	.6	.2	.....	.....	.....	3.3	4.0	8.2	2.0	.7	.6	.2
9	2.0	.2	.....	.....	.....	3.8	3.8	7.0	a4.3	.7	.5	.0
10	1.8	.1	.....	.....	.....	3.3	3.9	6.2	1.6	.7	.5	.2
11	1.7	.1	.....	.....	.....	.....	3.8	5.8	1.4	.7	.5	.2
12	1.2	.1	.....	.....	.....	2.9	3.8	5.5	1.3	.7	.2	.2
13	1.2	.1	.....	.....	.....	2.8	3.9	5.8	1.2	.6	.5	.2
14	1.0	.1	.....	.....	.....	3.0	4.7	6.8	1.2	.5	.4	.2
15	1.0	.1	.....	.....	.....	3.1	4.9	7.3	1.2	.5	.4	.2
16	.8	.1	.....	.....	.....	2.8	6.1	14.0	a6.6	.4	.3	.2
17	.2	.0	.....	.....	.....	3.3	6.8	11.7	.0	.3	.3	.2
18	.1	.0	.....	.....	.....	.....	7.8	10.8	1.2	.3	.3	.2
19	.2	.0	.....	.....	.....	5.1	8.9	10.2	1.2	.3	.3	.2
20	.1	.0	.....	.....	.....	5.7	10.2	8.3	1.3	.3	.3	.2
21	a7.0	— .1	.....	.....	.....	6.8	10.4	7.3	1.8	.2	.2	.2
22	.0	.0	.....	.....	.....	7.7	10.2	6.3	1.8	.2	.3	.3
23	.0	.....	.....	.....	.....	7.3	9.0	5.2	1.8	.2	.2	.2
24	.0	.....	.....	.....	.....	7.2	7.6	4.8	1.8	.2	.2	.4
25	.2	.....	.....	.....	.....	.....	7.2	4.7	1.8	.2	.0	.4
26	.2	.....	.....	.....	.....	3.5	6.5	4.2	1.8	.2	.3	.3
27	.1	.....	.....	.....	.....	3.2	5.8	4.0	2.0	.2	.2	.3
28	a6.5	.....	.....	.....	.....	3.8	4.9	3.7	1.8	.2	.2	.3
29	.0	.....	.....	.....	.....	3.5	4.7	3.6	1.5	.1	.2	.3
30	.0	.....	.....	.....	.....	3.1	5.2	3.3	1.5	.0	.2	.0
31	.0	.....	.....	.....	.....	3.2	.....	3.1	.....	.0	.2	.....
1894–95.												
1	.0	1.2	.....	.....	.....	.....	.8	2.0	a6.0	1.2	1.2	— .5
2	.0	1.4	.....	.....	.....	.....	.5	1.9	.0	1.3	.2	— .5
3	.1	1.4	.....	.....	.....	.....	.5	2.0	3.1	2.1	a5.5	.2
4	.2	1.4	.....	.....	.....	.....	.5	3.5	3.6	2.1	.0	a3.0
5	.0	1.3	.....	.....	.....	.....	.5	4.2	4.0	.7	.0	2.8
6	.0	1.4	.....	.....	.....	.....	.4	4.0	3.2	a5.1	.2	2.5
7	.0	1.4	.....	.....	.....	.....	.....	3.8	2.5	1.1	.3	2.5
8	.1	1.5	.....	.....	.....	.....	1.0	3.7	a5.1	1.5	.3	.....
9	.2	1.5	.....	.....	.....	.....	1.6	3.8	.7	1.2	.3	.2
10	.2	1.5	.....	.....	.....	.....	1.1	3.5	2.5	.8	1.0	.2
11	.2	1.3	.....	.....	.....	.....	1.2	3.2	3.4	1.8	.....	.2
12	.2	.8	.....	.....	.....	.....	1.6	6.4	6.2	2.4	1.8	.2
13	.2	.8	.....	.....	.....	.....	1.8	5.8	6.8	a5.3	1.5	.2
14	.2	.6	.....	.....	.....	.....	1.3	5.6	5.2	.....	1.4	.2
15	.2	.6	.....	.....	.....	.....	.5	4.8	6.2	2.5	1.4	.....
16	.0	.5	.....	.....	.....	.....	1.0	4.4	.....	2.4	a5.5	.2
17	.0	.3	.....	.....	.....	.....	.8	3.6	4.3	2.8	.8	.2
18	.1	.3	.....	.....	.....	.....	1.2	3.2	3.2	2.8	.2	.3
19	.1	.3	.....	.....	.....	.....	.8	2.6	4.2	2.8	.5	.8
20	.0	.....	.....	.....	.....	.....	.4	a6.2	2.2	2.8	.2	.8
21	.0	.....	.....	.....	.....	.....	.4	1.6	1.6	2.3	.3	1.0
22	.1	.....	.....	.....	.....	.....	.4	2.1	a5.1	2.5	a1.3	1.7
23	.2	.....	.....	.....	.....	.....	1.0	2.0	.....	2.7	.3	4.7
24	.2	.....	.....	.....	.....	.....	.5	1.8	2.2	2.8	.3	5.9
25	.6	.....	.....	.....	.....	.....	.5	a6.2	2.4	2.1	.4	5.7
26	.9	.....	.....	.....	.....	.....	.7	.2	3.2	2.1	.5	4.8
27	.7	.....	.....	.....	.....	.....	a4.3	.8	2.5	a3.8	.4	3.8
28	.9	.....	.....	.....	.....	.....	.....	1.2	2.0	.2	.4	2.3
29	1.5	.....	.....	.....	.....	.....	.2	1.5	a5.8	1.1	.2	2.3
30	.8	.....	.....	.....	.....	.....	1.4	1.1	1.2	1.5	— .4	2.3
31	1.1	.....	.....	.....	.....	.....	.....	1.6	.....	1.3	— .5	.....

a Flood for log driving.

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Daily gage height, in feet, of Chippewa River at Chippewa Falls, Wis., for the years ending Sept. 30, 1888–1889—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1895–96.												
1	1.2	0.0	.....	.....	.....	.....	.....	6.8	3.6	2.0	1.5	0.8
2	.8	— .3	.....	.....	.....	.....	.....	6.5	4.2	a5.2	.....	.8
3	1.1	— .3	.....	.....	.....	.....	.....	7.5	4.0	.8	1.5	.8
4	1.2	— .3	.....	.....	.....	.....	.....	8.0	3.0	2.0	1.5	.8
5	.9	.1	.....	.....	.....	.....	.....	7.2	3.0	2.0	1.5	.8
6	.8	.2	.....	.....	.....	.....	.....	6.5	2.9	2.8	1.5	.....
7	.8	.2	.....	.....	.....	.....	.....	5.8	a5.6	2.8	1.3	.1
8	.8	.2	.....	.....	.....	.....	.....	5.8	3.8	2.2	1.3	2.4
9	.7	.2	.....	.....	.....	.....	.....	3.8	5.3	a4.8	.....	1.4
10	.2	.....	.....	.....	.....	.....	.....	4.1	6.0	1.8	a3.9	1.2
11	a4.8	.2	.....	.....	.....	.....	.....	5.1	5.1	2.0	2.0	1.0
12	.5	.2	.....	.....	.....	.....	.....	3.8	4.3	1.5	1.8	1.8
13	.....	.2	.....	.....	.....	.....	4.6	3.8	a5.0	1.5	2.5	.....
14	.3	.2	.....	.....	.....	.....	7.8	4.8	a4.8	1.2	2.6	1.2
15	.3	.2	.....	.....	.....	.....	9.5	5.9	.....	1.8	1.9	1.5
16	.4	.0	.....	.....	.....	.....	10.7	7.8	3.0	2.3	.....	.8
17	.3	.0	.....	.....	.....	.....	11.0	6.5	4.0	2.3	.5	.0
18	.2	.....	.....	.....	.....	.....	11.2	7.2	4.0	4.5	.5	.5
19	.3	— .2	.....	.....	.....	.....	12.0	7.6	4.0	1.5	.5	.8
20	.3	.....	.....	.....	.....	.....	11.9	7.2	a6.0	1.6	.5	.....
21	.2	.....	.....	.....	.....	.....	11.2	7.2	3.5	1.2	.....	1.4
22	.2	.....	.....	.....	.....	.....	9.6	4.8	3.2	1.2	1.2	1.2
23	.2	.....	.....	.....	.....	.....	8.5	5.2	2.8	1.6	.....	1.0
24	.2	.....	.....	.....	.....	.....	7.5	4.8	3.2	1.5	.8	1.1
25	.2	.....	.....	.....	.....	.....	7.3	4.1	4.0	2.2	.8	1.1
26	.2	.....	.....	.....	.....	.....	7.2	4.5	4.2	1.5	.....	a2.0
27	.....	.....	.....	.....	.....	.....	7.0	4.2	a5.5	1.7	.9	.....
28	.2	.....	.....	.....	.....	.....	7.5	4.0	2.2	1.3	.9	1.0
29	.1	.....	.....	.....	.....	.....	7.0	3.9	2.0	1.3	1.0	.8
30	.0	.....	.....	.....	.....	.....	7.0	5.8	2.2	1.5	.....	.8
31	— .2	.....	.....	.....	.....	.....	.....	3.0	.....	1.3	1.0	.....
1896–97.												
1	0.8	.....	21.2	.....	.....	.....	13.8	5.8	2.5	4.5	5.0	1.0
2	.8	4.0	22.4	.....	.....	.....	17.0	5.3	2.8	4.0	4.5	1.0
3	.8	4.1	23.8	.....	.....	.....	15.2	4.8	5.2	3.2	4.0	1.8
4	.....	3.8	24.5	.....	.....	.....	10.5	4.2	7.0	4.0	4.0	1.8
5	.8	3.5	23.0	.....	.....	.....	10.6	3.8	a8.8	3.2	3.8	1.8
6	.8	3.5	20.0	.....	.....	.....	10.5	3.8	6.0	3.0	3.0	1.8
7	1.0	.....	19.6	.....	.....	.....	9.3	3.0	5.5	3.0	3.0	1.8
8	1.0	.....	17.5	.....	.....	.....	8.5	3.2	5.8	2.5	2.8	1.8
9	1.0	3.8	.....	.....	.....	.....	7.8	2.8	5.0	1.2	2.8	a6.0
10	.8	3.0	.....	.....	.....	.....	7.2	3.2	5.2	a3.1	2.5	1.5
11	.....	2.5	.....	.....	.....	.....	6.5	a3.5	5.5	1.0	2.2	1.5
12	.5	2.0	.....	.....	.....	.....	6.2	2.8	5.4	2.0	2.2	.3
13	.5	.....	.....	.....	.....	.....	5.8	3.2	4.5	2.0	2.2	1.8
14	.8	.....	.....	.....	.....	.....	5.8	3.2	4.3	1.2	2.2	2.0
15	.5	.....	.....	.....	.....	.....	6.0	a5.4	4.0	1.5	3.0	2.2
16	.8	.....	.....	.....	.....	.....	6.5	2.8	a5.8	1.2	1.5	2.0
17	.....	.....	.....	.....	.....	.....	6.5	2.0	4.3	1.2	1.7	1.5
18	.....	.....	.....	.....	.....	.....	6.0	2.5	7.2	.8	1.5	1.5
19	1.0	.....	.....	.....	.....	.....	6.0	2.5	7.5	1.5	1.5	1.5
20	1.0	.....	.....	.....	.....	8.5	5.6	4.2	6.3	1.2	1.5	1.5
21	1.0	.....	.....	.....	.....	8.3	5.2	6.0	6.0	1.5	a5.2	1.5
22	1.0	.....	.....	.....	.....	8.5	5.0	a7.6	4.5	1.2	1.2	1.5
23	1.0	.....	.....	.....	.....	8.7	5.2	5.0	4.5	1.8	1.5	1.3
24	.8	.....	.....	.....	.....	9.3	5.3	5.2	4.4	1.8	1.3	1.2
25	.8	.....	.....	.....	.....	8.8	5.0	5.2	4.1	1.8	1.5	1.2
26	.8	.....	.....	.....	.....	9.0	4.6	5.2	3.8	2.2	1.2	.5
27	.8	13.7	.....	.....	.....	8.5	4.7	4.8	2.8	5.8	1.2	.5
28	.8	13.7	.....	.....	.....	8.8	4.3	4.2	2.8	7.2	1.2	1.9
29	.8	10.5	.....	.....	.....	9.7	4.8	a6.0	3.5	6.5	.5	1.0
30	2.0	16.0	.....	.....	.....	11.1	5.7	1.5	4.2	6.5	.5	1.0
31	2.5	.....	.....	.....	.....	13.8	.....	2.0	.....	5.2	1.0	.....

a Flood for log driving.

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Daily gage height, in feet, of Chippewa River at Chippewa Falls, Wis., for the year ending Sept. 30, 1888–1899—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1897–98.												
1	1.2	1.2	.....	.....	.....	.....	3.8	2.8	3.8	3.2	1.0	1.0
2	1.2	1.2	.....	.....	.....	.....	3.5	2.8	3.8	3.2	1.0	1.0
3	1.0	1.2	.....	.....	.....	.....	3.2	3.8	3.3	3.2	1.0	1.0
4	1.2	1.2	.....	.....	.....	.....	3.0	4.0	[a]6.2	3.2	1.0	.5
5	1.0	1.2	.....	.....	.....	.....	2.8	3.8	1.2	3.2	1.0	.5
6	1.7	1.2	.....	.....	.....	.....	2.5	3.5	2.0	3.2	1.0	.8
7	1.5	1.2	.....	.....	.....	.....	2.0	[a]5.3	1.5	3.2	[a]2.6	.8
8	1.0	1.2	.....	.....	.....	.....	2.0	1.8	3.0	4.0	1.2	1.0
9	[a]3.3	1.2	.....	.....	.....	.....	2.0	1.5	3.8	[a]5.3	1.0	.5
10	.8	1.2	.....	.....	.....	.....	2.0	3.0	3.0	1.7	.8	.5
11	.8	1.2	.....	.....	.....	.....	2.0	3.0	[a]6.4	2.0	.5	.5
12	.8	1.2	.....	.....	.....	.....	2.2	3.0	1.5	2.5	.5	1.0
13	1.0	1.2	.....	.....	.....	.....	2.5	2.8	1.8	2.5	.5	.8
14	.8	1.0	.....	.....	.....	.....	3.0	[a]5.2	3.8	2.2	[a]1.6	1.0
15	.8	1.0	.....	.....	.....	.....	2.8	1.5	4.0	2.0	1.0	.7
16	1.5	1.0	.....	.....	.....	.....	2.5	1.5	4.5	[a]3.8	1.0	.8
17	2.0	1.2	.....	.....	.....	.....	2.5	1.8	4.0	.5	1.0	1.0
18	2.5	1.0	.....	.....	.....	.....	2.2	2.0	[a]5.4	1.0	[a]2.5	1.0
19	2.5	1.0	.....	.....	.....	.....	3.0	2.2	3.0	1.0	1.5	1.0
20	2.5	1.0	.....	.....	.....	.....	2.5	2.5	2.0	1.5	1.5	.....
21	2.3	1.0	.....	.....	.....	.....	3.0	[a]5.8	2.5	1.8	1.2	.....
22	2.2	1.0	.....	.....	.....	.....	3.2	2.0	2.8	1.5	1.5	.....
23	6.3	.....	.....	.....	.....	.....	5.5	2.0	2.8	[a]4.0	1.2	.8
24	1.7	.....	.....	.....	.....	.....	4.2	1.8	2.8	.2	1.0	.8
25	2.0	.....	.....	.....	.....	.....	4.0	2.5	[a]4.8	1.0	1.2	.0
26	2.0	.....	.....	.....	.....	.....	3.8	2.8	1.8	1.0	1.0	1.0
27	1.5	.....	.....	.....	.....	.....	3.5	2.0	2.0	1.0	1.0	1.0
28	1.5	.....	.....	.....	.....	.....	3.2	[a]6.8	3.0	1.0	1.0	.....
29	1.5	.....	.....	.....	.....	3.5	3.2	5.3	3.5	1.2	1.0	.....
30	1.2	.....	.....	.....	.....	4.0	3.0	4.8	3.2	1.0	1.0	.....
31	1.2	.....	.....	.....	.....	4.2	.....	4.2	.....	1.0	1.0	.....
1898–99.												
1	.....	.8	.....	.....	.....	.....	.....	7.33	2.50	5.71	1.58	1.17
2	.7	.8	.....	.....	.....	.....	.....	7.50	3.33	1.00	6.50	1.00
3	1.0	.8	.....	.....	.....	.....	.....	7.50	5.75	1.67	1.00	1.00
4	1.0	1.0	.....	.....	.....	.....	.....	7.75	3.50	1.83	1.25	1.00
5	1.0	.8	.....	.....	.....	.....	.....	6.75	4.08	2.00	1.50	1.17
6	1.0	.8	.....	.....	.....	.....	.....	8.75	4.83	2.25	.75	1.17
7	1.0	.8	.....	.....	.....	.....	1.00	5.67	4.83	2.17	1.50	1.17
8	1.0	.8	.....	.....	.....	.....	1.42	4.50	4.75	4.79	1.50	1.17
9	1.0	.8	.....	.....	.....	.....	2.50	4.25	5.67	1.50	1.50	1.25
10	1.0	1.0	.....	.....	.....	.....	2.67	3.50	6.50	1.50	1.50	1.33
11	1.1	.8	.....	.....	.....	.....	3.17	3.33	3.00	1.83	1.50	1.67
12	1.1	.8	.....	.....	.....	.....	3.29	4.00	2.50	1.83	1.33	1.75
13	1.2	.....	.....	.....	.....	.....	4.47	6.12	4.83	4.16	1.00	1.67
14	1.2	.8	.....	.....	.....	.....	6.25	1.83	5.50	.....	1.00	1.67
15	1.5	.8	.....	.....	.....	.....	6.00	2.00	7.00	.....	1.50	1.33
16	1.2	.8	.....	.....	.....	.....	6.33	2.75	6.67	1.00	1.00	4.25
17	1.3	.8	.....	.....	.....	.....	6.33	4.50	5.75	1.33	1.00	.....
18	1.5	.8	.....	.....	.....	.....	5.25	6.25	4.12	.33	1.00	1.00
19	1.2	.8	.....	.....	.....	.....	5.00	6.50	3.75	.33	6.12	1.26
20	1.2	.8	.....	.....	.....	.....	5.00	8.38	4.75	1.08	1.50	1.25
21	1.2	.8	.....	.....	.....	.....	5.25	4.00	4.00	1.42	1.50	1.00
22	1.2	.....	.....	.....	.....	.....	5.25	4.33	4.00	1.42	1.25	1.00
23	.....	.....	.....	.....	.....	.....	4.83	3.83	3.67	1.42	1.33	1.00
24	1.1	.....	.....	.....	.....	.....	4.50	3.25	6.54	1.58	1.17	.....
25	.8	.....	.....	.....	.....	.....	4.00	3.25	1.83	2.00	1.17	1.17
26	.8	.....	.....	.....	.....	.....	3.75	3.00	1.83	2.00	1.00	1.08
27	.8	.....	.....	.....	.....	.....	2.34	5.58	2.00	1.83	1.00	1.00
28	.8	.....	.....	.....	.....	.....	4.00	3.50	2.25	1.83	1.33	1.00
29	.8	.....	.....	.....	.....	.....	8.50	4.00	2.30	1.17	1.17	1.08
30	.....	.....	.....	.....	.....	.....	4.83	3.50	2.58	.....	1.17	1.08
31	.8	.....	.....	.....	.....	.....	.....	3.75	.....	1.58	1.17	.....

[a] Floods for log driving.

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Daily gage height, in feet, of Chippewa River at Chippewa Falls, Wis., for the year ending Sept. 30, 1913.

[August Flug, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	.....	.....	.....	.....	.....	5.2	4.5	4.0	1.0	3.0	1.5
2	.....	.....	.....	.....	.....	.....	7.2	4.5	4.0	1.0	2.2	1.15
3	.....	.....	.....	1.5	1.2	0.9	10.0	4.0	3.5	.65	2.0	1.15
4	.....	.....	.....	.....	.....	.....	11.0	3.8	3.5	1.0	2.0	1.5
5	.....	.....	.....	.....	.....	.....	10.0	3.8	3.0	3.3	1.8	1.8
6	.....	.....	.....	1.5	.....	.....	8.0	3.5	2.3	7.7	1.7	1.5
7	.....	.....	.....	.....	1.2	.9	7.7	3.2	2.3	7.2	1.5	1.7
8	.....	.....	.....	.....	.....	.....	6.7	3.0	4.0	6.0	1.5	1.35
9	.....	.....	.....	.....	.....	.....	6.2	2.8	3.8	5.2	1.35	1.35
10	.....	.....	.....	1.5	1.0	1.2	5.5	2.5	3.3	5.2	1.35	1.35
11	.....	.....	.....	.....	.....	.....	5.3	2.7	3.0	4.8	1.15	1.35
12	.....	.....	.....	.....	.....	.....	4.5	2.7	2.8	4.8	1.15	1.15
13	.....	.....	.....	.....	.....	.....	5.2	2.3	2.7	4.0	1.35	1.15
14	.....	.....	.....	.....	1.0	3.4	6.0	2.3	2.5	4.0	1.35	1.15
15	.....	.....	.....	.....	.....	.....	6.3	2.3	2.3	3.8	1.15	1.15
16	.....	.....	1.5	.....	.....	.....	7.2	2.7	2.3	3.5	1.0	1.15
17	.....	.....	.....	1.5	.9	2.0	6.5	3.3	2.0	3.7	1.0	1.15
18	.....	.....	.....	.....	.....	.....	7.7	4.3	2.0	3.3	1.0	1.0
19	.....	.....	.....	.....	.....	.....	7.8	4.7	2.0	3.2	1.5	.85
20	.....	.....	1.5	1.4	.....	.....	7.5	4.7	2.0	3.5	3.3	1.0
21	.....	.....	.....	.....	.9	2.6	7.0	5.0	1.8	3.2	3.3	1.15
22	.....	.....	.....	.....	.....	.....	6.5	6.3	1.5	2.8	3.3	1.5
23	.....	.....	1.5	.....	.....	.....	6.2	6.8	1.35	2.3	2.7	1.5
24	.....	.....	.....	1.4	.9	2.5	6.2	6.3	1.35	2.2	2.5	1.7
25	.....	.....	.....	.....	.....	.....	6.0	5.3	1.7	2.2	2.0	1.7
26	.....	.....	.....	.....	.....	.....	6.0	5.0	1.15	2.0	2.0	2.2
27	.....	.....	1.5	1.3	.....	.....	5.8	4.3	1.15	2.0	1.7	2.3
28	.....	.....	.....	.....	.9	2.7	5.3	3.7	1.0	2.2	1.7	2.5
29	.....	.....	.....	.....	.....	.....	5.0	3.8	1.0	3.0	1.35	2.3
30	.....	.....	1.5	.....	.....	.....	5.0	4.0	1.0	3.2	1.15	2.0
31	.....	.....	.....	1.2	.....	4.3	.....	4.0	.....	3.5	1.5	.....

NOTE.—Discharge relation probably affected by ice about Dec. 16, 1912, to Mar. 31, 1913.

Daily discharge, in second-feet, of Chippewa River at Chippewa Falls, Wis., for the years ending Sept. 30, 1888–1899.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1888.					1888.				
1	.....	7,840	5,900	3,410	16	.....	3,640	9,000	3,180
2	.....	13,000	3,870	3,240	17	.....	4,110	8,130	3,180
3	.....	6,440	4,850	3,180	18	.....	5,000	8,130	3,180
4	.....	5,900	7,000	3,180	19	.....	24,200	8,700	3,180
5	.....	4,600	10,300	3,180	20	.....	8,400	15,900	3,180
6	.....	5,630	13,600	3,180	21	.....	5,630	6,170	3,180
7	.....	6,170	13,900	3,180	22	.....	4,140	5,110	3,180
8	.....	7,000	13,300	3,180	23	.....	3,640	4,600	4,140
9	.....	8,130	13,000	3,180	24	.....	3,640	4,350	5,110
10	.....	7,280	15,200	3,180	25	.....	4,110	4,350	3,870
11	.....	18,700	13,900	3,180	26	.....	3,870	4,110	3,520
12	.....	6,440	13,000	3,180	27	.....	3,640	3,870	3,180
13	.....	3,640	12,000	3,180	28	.....	3,640	3,870	3,180
14	.....	2,960	10,800	3,180	29	.....	3,870	3,870	2,740
15	.....	3,300	10,200	3,180	30	.....	4,350	3,640	3,420
					31	.....	12,600	3,640	.....

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Daily discharge, in second-feet, of Chippewa River at Chippewa Falls, Wis., for the years ending Sept. 30, 1888–1899—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1888–89.												
1	4,110						4,890	7,000	10,800	6,720	1,750	1,750
2	3,190						4,600	7,280	2,120	8,710	1,930	1,930
3	2,980						4,110	7,840	4,350	8,420	1,750	1,930
4	1,750						2,180	7,280	7,840	8,420	1,750	1,930
5	2,740						3,640	7,560	9,580	17,000	1,750	17,600
6	2,120						3,870	7,840	10,500	9,580	1,930	1,430
7	2,450						3,980	8,710	19,800	8,010	1,750	1,300
8	3,190						4,110	21,300	9,280	6,440	1,750	1,300
9	2,980	19,900					15,600	10,200	6,240	1,930	1,580	1,580
10	2,980	3,870					5,110	5,630	3,180	2,120	1,750	1,750
11	2,980	3,870					3,180	13,600	9,580	2,120	1,940	1,750
12	2,980	3,870					3,640	12,400	6,440	3,870	2,120	1,750
13	2,120						4,350	11,700	7,280	4,600	2,120	1,750
14	3,000						4,980	22,800	7,000	5,400	2,020	1,750
15	3,870						5,630	12,000	7,560	13,600	1,930	1,750
16	3,190						6,170	3,870	8,570	5,630	1,750	13,600
17	2,740						5,370	11,400	9,580	1,430	1,750	2,120
18	2,120						5,630	15,900	7,840	1,430	1,580	2,120
19	4,850						5,630	15,900	8,420	1,750	9,580	1,750
20	3,870						18,400	15,900	9,280	1,750	3,410	1,930
21	3,870						7,000	22,400	16,300	1,940	3,410	1,930
22	3,870						3,180	16,300	10,800	2,120	2,120	1,930
23	3,870						4,850	9,870	5,630	2,120	2,120	1,930
24	3,870						8,420	5,370	9,870	2,320	1,930	2,120
25	3,180						9,000	11,700	11,100	2,120	2,300	1,930
26	3,350						9,870	11,400	11,700	2,320	13,000	1,750
27	3,520						11,100	10,500	11,700	2,120	3,180	2,120
28	3,700						10,600	8,420	19,800	1,430	1,080	2,120
29	3,870					6,440	10,200	8,420	13,000	8,130	1,430	2,120
30	3,870					6,170	7,000	8,500	9,860	1,430	1,750	2,120
31	3,180							13,300		1,750	1,750	
1889–90.												
1	2,120	730						7,560	14,000	1,580	2,120	2,980
2	2,120							7,840	12,300	3,180	2,120	2,960
3	1,750							7,000	12,600	5,370	1,940	1,930
4	1,930						7,560	5,370	12,600	4,980	1,750	4,850
5	1,750						5,630	10,500	13,900	4,600	1,750	10,500
6	1,660						6,320	11,100	18,700	4,600	1,750	11,700
7	1,580						7,000	1,750	19,800	4,350	1,750	11,800
8	1,430						12,300	2,960	19,100	4,350	1,750	12,000
9	1,430						17,300	3,180	19,100	4,350	2,120	11,700
10	1,430						18,700	12,000	16,300	4,350	14,600	10,500
11	1,300						20,900	3,180	17,700	2,120	14,600	10,800
12	1,300						25,000	1,300	16,300	10,800	13,600	5,630
13	1,360						27,200	1,750	15,600	3,000	12,300	2,960
14	1,430						26,900	3,870	13,000	2,120	6,170	3,660
15	1,300						25,000	4,110	11,600	2,120	5,110	4,350
16	1,430						20,500	3,870	10,200	4,850	6,720	4,350
17	1,430						18,000	11,400	9,870	8,710	5,660	4,110
18	1,300						18,000	3,640	8,130	7,560	4,600	4,110
19	1,300						17,300	2,120	7,000	13,300	4,350	4,350
20	1,300						14,900	4,600	6,440	3,000	4,600	7,000
21	1,300						14,600	8,130	5,630	2,120	8,130	9,870
22	1,300						14,600	9,870	5,120	2,120	7,840	9,870
23	1,300						13,900	11,700	4,600	2,120	7,000	8,420
24	1,300						13,900	21,600	4,600	3,180	5,800	7,000
25	1,190						13,000	18,400	11,400	3,410	4,600	5,630
26	1,090						13,900	15,200	3,180	10,200	5,370	5,110
27	1,090						13,300	17,000	1,930	3,000	5,370	14,600
28	1,090						11,100	13,000	1,930	2,120	5,370	5,600
29	860						11,100	13,000	1,760	2,120	8,710	3,870
30	860						8,710	11,100	1,580	2,120	6,720	2,320
31	860							19,500		2,120	4,000	

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Daily discharge, in second-feet, of Chippewa River at Chippewa Falls, Wis., for the years ending Sept. 30, 1888–1899—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1890–91.												
1	2,960	2,320	.....	.....	.....	.....	.....	14,900	1,300	2,740	860	860
2	2,960	2,320	.....	.....	.....	.....	.....	11,700	2,120	2,960	1,080	1,190
3	2,530	2,320	.....	.....	.....	.....	.....	10,800	2,320	2,960	1,300	1,090
4	2,530	2,120	.....	.....	.....	.....	.....	9,870	3,410	2,120	1,930	670
5	2,530	5,110	.....	.....	.....	.....	.....	11,700	4,350	2,320	1,930	670
6	2,530	3,640	.....	.....	.....	.....	.....	8,420	2,960	2,320	1,750	5,110
7	2,120	2,320	.....	.....	.....	.....	.....	5,110	3,540	1,930	1,580	1,190
8	2,320	1,750	.....	.....	.....	.....	.....	3,410	4,110	1,930	1,930	860
9	2,120	1,660	.....	.....	.....	.....	.....	5,630	4,110	1,930	1,560	860
10	2,120	1,580	.....	.....	.....	.....	.....	5,630	4,110	1,930	1,190	860
11	1,750	.....	.....	.....	.....	.....	.....	5,630	4,350	12,300	1,190	860
12	2,360	.....	.....	.....	.....	.....	.....	5,370	5,110	1,000	1,090	860
13	2,960	.....	.....	.....	.....	.....	7,840	17,700	5,630	860	1,090	860
14	7,000	.....	.....	.....	.....	.....	11,100	4,110	4,990	860	1,090	860
15	11,700	.....	.....	.....	.....	.....	14,600	4,600	4,350	860	860	860
16	12,300	.....	.....	.....	.....	.....	16,600	3,180	4,600	860	860	790
17	20,200	.....	.....	.....	.....	.....	20,900	4,400	3,870	860	860	790
18	11,700	.....	.....	.....	.....	.....	21,300	5,630	4,110	860	860	790
19	10,200	.....	.....	.....	.....	.....	23,400	5,110	3,410	860	3,870	860
20	8,710	.....	.....	.....	.....	.....	25,400	5,110	14,600	860	2,120	860
21	7,280	.....	.....	.....	.....	.....	22,800	14,900	2,700	1,090	1,090	860
22	6,440	.....	.....	.....	.....	.....	22,000	3,640	1,750	1,090	1,090	790
23	2,120	.....	.....	.....	.....	.....	26,900	2,120	2,120	1,930	1,090	790
24	2,530	.....	.....	.....	.....	.....	27,200	2,430	1,930	1,930	1,090	790
25	2,960	.....	.....	.....	.....	.....	25,400	2,740	4,110	1,930	860	730
26	3,780	.....	.....	.....	.....	.....	22,800	4,110	4,110	1,510	1,090	730
27	4,600	.....	.....	.....	.....	.....	20,200	3,870	3,180	1,090	1,090	730
28	2,320	.....	.....	.....	.....	.....	19,100	3,870	3,070	860	1,090	730
29	2,320	.....	.....	.....	.....	.....	15,200	14,600	2,960	1,090	1,090	730
30	2,740	.....	.....	.....	.....	.....	14,600	12,600	2,740	1,090	980	730
31	2,320	.....	.....	.....	.....	.....	.....	2,000	.....	860	860	.....
1891–92.												
1	730	2,000	.....	.....	.....	.....	2,120	1,010	13,000	19,100	6,440	1,090
2	790	1,190	.....	.....	.....	.....	4,350	4,850	11,700	13,600	5,110	1,010
3	930	1,190	.....	.....	.....	.....	13,900	7,000	9,870	17,000	4,850	1,010
4	1,010	1,190	.....	.....	.....	.....	16,300	9,870	10,200	16,300	4,350	2,740
5	1,090	1,190	.....	.....	.....	.....	19,800	10,500	8,420	15,600	1,750	1,090
6	2,320	1,190	.....	.....	.....	.....	18,700	11,400	7,840	12,300	14,900	1,190
7	2,740	1,190	.....	.....	.....	.....	20,500	12,000	10,500	10,200	860	1,090
8	1,300	1,190	.....	.....	.....	.....	18,000	13,300	14,600	7,560	1,430	1,190
9	1,010	1,190	.....	.....	.....	.....	14,600	10,200	14,600	9,290	1,930	1,300
10	1,300	1,190	.....	.....	.....	.....	12,700	13,300	13,000	2,120	1,930	1,430
11	1,430	1,190	.....	.....	.....	.....	10,800	11,700	12,300	4,850	1,930	1,930
12	1,750	1,090	.....	.....	.....	.....	4,350	12,300	10,500	1,580	2,740	2,120
13	2,120	1,090	.....	.....	.....	.....	5,630	13,300	9,870	3,180	2,740	2,530
14	1,930	1,010	.....	.....	.....	.....	4,600	13,600	9,290	3,410	1,300	1,750
15	1,750	1,010	.....	.....	.....	.....	4,350	13,600	7,560	4,350	1,580	2,530
16	1,580	1,010	.....	.....	.....	.....	4,110	17,000	8,130	18,700	1,750	2,120
17	13,900	.....	.....	.....	.....	.....	3,990	18,000	12,300	1,010	1,750	2,120
18	1,500	.....	.....	.....	.....	.....	3,870	19,100	15,600	1,300	1,300	1,750
19	1,430	.....	.....	.....	.....	.....	3,410	18,000	15,200	3,870	1,300	2,120
20	1,430	.....	.....	.....	.....	.....	2,530	30,300	15,600	4,350	6,440	1,750
21	2,530	.....	.....	.....	.....	.....	3,410	35,800	15,200	3,870	860	1,580
22	1,750	.....	.....	.....	.....	.....	4,350	34,600	13,600	1,750	860	1,300
23	1,010	.....	.....	.....	.....	.....	15,900	30,300	13,000	16,300	860	1,300
24	1,010	.....	.....	.....	.....	.....	1,300	22,800	12,300	1,300	860	1,300
25	1,060	.....	.....	.....	.....	.....	1,750	20,500	9,870	1,300	860	1,010
26	1,090	.....	.....	.....	.....	.....	2,120	18,400	7,840	1,430	4,850	1,090
27	1,090	.....	.....	.....	.....	.....	2,320	17,000	19,500	1,750	1,090	1,090
28	1,190	.....	.....	.....	.....	.....	4,600	15,200	28,800	8,130	1,010	1,090
29	1,190	.....	.....	.....	.....	.....	4,850	14,900	28,000	11,100	1,010	1,090
30	1,190	.....	.....	.....	.....	.....	15,900	14,600	24,200	9,870	1,010	1,090
31	12,300	.....	.....	.....	.....	.....	.....	15,200	.....	7,560	1,010	.....

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Daily discharge, in second-feet, of Chippewa River at Chippewa Falls, Wis., for the years ending Sept. 30, 1888–1899—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1892–93.												
1	1,010	1,090	.....	.....	.....	.....	.....	20,500	10,800	15,900	1,300	1,190
2	1,010	1,090	.....	.....	.....	.....	.....	21,600	9,000	930	1,300	1,090
3	1,010	1,090	.....	.....	.....	.....	6,440	23,500	6,720	1,010	2,320	1,090
4	1,010	1,090	.....	.....	.....	.....	7,280	23,500	7,000	1,010	1,750	1,090
5	930	1,090	.....	.....	.....	.....	9,000	20,900	6,720	2,530	1,300	1,010
6	930	1,090	.....	.....	.....	.....	10,800	17,000	9,290	3,870	1,580	1,190
7	930	1,090	.....	.....	.....	.....	11,100	13,900	8,710	4,600	3,180	1,190
8	930	1,010	.....	.....	.....	.....	11,700	17,000	16,600	4,600	1,750	1,190
9	860	1,010	.....	.....	.....	.....	12,000	15,200	3,870	6,440	1,750	1,010
10	930	.....	.....	.....	.....	.....	14,900	17,000	3,870	4,850	1,190	1,010
11	930	.....	.....	.....	.....	.....	15,600	24,600	3,410	14,200	1,300	1,010
12	930	.....	.....	.....	.....	.....	18,000	37,800	3,410	1,090	1,190	1,010
13	930	.....	.....	.....	.....	.....	22,000	38,200	5,630	1,750	1,090	1,010
14	930	.....	.....	.....	.....	.....	24,200	33,800	3,870	6,170	1,090	1,010
15	930	.....	.....	.....	.....	.....	20,500	30,300	3,870	6,170	1,010	1,010
16	930	.....	.....	.....	.....	.....	17,300	28,000	14,900	5,370	1,010	1,010
17	930	.....	.....	.....	.....	.....	15,600	22,800	860	5,110	1,010	1,010
18	1,010	.....	.....	.....	.....	.....	13,000	20,900	1,300	5,370	1,010	1,090
19	1,010	.....	.....	.....	.....	.....	13,600	17,000	3,180	3,870	1,010	1,090
20	1,090	.....	.....	.....	.....	.....	13,600	16,600	3,180	3,870	1,010	1,010
21	1,090	.....	.....	.....	.....	.....	13,000	10,800	3,410	3,870	1,010	1,010
22	1,090	.....	.....	.....	.....	.....	13,300	12,300	5,630	9,290	1,010	930
23	1,090	.....	.....	.....	.....	.....	10,800	12,000	4,350	1,300	1,010	930
24	1,090	.....	.....	.....	.....	.....	9,290	15,600	15,200	1,300	1,090	930
25	1,190	.....	.....	.....	.....	.....	10,500	19,800	860	1,010	1,090	930
26	1,300	.....	.....	.....	.....	.....	13,900	24,200	3,180	1,010	1,190	930
27	1,190	.....	.....	.....	.....	.....	21,300	22,800	4,600	1,190	1,190	930
28	1,090	.....	.....	.....	.....	.....	27,600	17,300	5,900	1,430	1,300	930
29	1,090	.....	.....	.....	.....	.....	26,500	20,500	5,900	1,300	1,300	930
30	1,090	.....	.....	.....	.....	.....	26,100	15,600	5,630	1,300	1,300	930
31	1,090	.....	.....	.....	.....	.....	.....	21,600	.....	1,300	1,300	.....
1893–94.												
1	860	930	.....	.....	.....	.....	6,860	11,400	6,720	2,530	860	1,010
2	860	.....	.....	.....	.....	.....	6,170	14,600	12,300	2,530	1,090	1,010
3	860	.....	.....	.....	.....	.....	4,850	15,600	2,530	2,320	1,090	1,010
4	860	.....	.....	.....	.....	.....	7,560	19,800	2,740	1,750	1,090	1,010
5	1,010	.....	.....	.....	.....	5,110	7,560	22,400	5,630	1,580	1,750	1,010
6	1,010	.....	.....	.....	.....	6,170	9,290	24,200	9,000	1,580	1,190	1,010
7	1,430	.....	.....	.....	.....	6,440	9,000	24,600	2,530	1,580	1,190	1,010
8	1,430	1,010	.....	.....	.....	7,840	9,870	24,200	4,350	1,580	1,430	1,010
9	4,350	1,010	.....	.....	.....	9,290	9,290	19,800	10,800	1,580	1,300	860
10	3,870	930	.....	.....	.....	7,840	9,580	17,000	3,410	1,580	1,300	1,010
11	3,640	930	.....	.....	.....	7,280	9,290	15,600	2,960	1,580	1,300	1,010
12	2,530	930	.....	.....	.....	6,720	9,290	14,600	2,740	1,580	1,010	1,010
13	2,530	930	.....	.....	.....	6,440	9,580	15,600	2,530	1,430	1,300	1,010
14	2,120	930	.....	.....	.....	7,000	12,000	19,100	2,530	1,300	1,190	1,010
15	2,120	930	.....	.....	.....	7,280	12,600	20,900	2,530	1,300	1,190	1,010
16	1,750	930	.....	.....	.....	6,440	16,600	47,300	18,400	1,190	1,090	1,010
17	1,010	860	.....	.....	.....	7,840	19,100	37,800	860	1,090	1,090	1,010
18	930	860	.....	.....	.....	10,000	22,800	34,200	2,530	1,090	1,090	1,010
19	1,010	860	.....	.....	.....	13,300	26,900	31,900	2,530	1,090	1,090	1,010
20	930	860	.....	.....	.....	15,200	31,900	24,600	2,740	1,090	1,090	1,010
21	19,800	790	.....	.....	.....	19,100	32,700	20,900	3,870	1,010	1,010	1,010
22	860	860	.....	.....	.....	22,400	31,900	17,300	3,870	1,010	1,090	1,090
23	860	.....	.....	.....	.....	20,900	27,200	13,600	3,870	1,010	1,010	1,010
24	800	.....	.....	.....	.....	20,500	22,000	12,300	3,870	1,010	1,010	1,190
25	1,010	.....	.....	.....	.....	14,000	20,500	12,000	3,870	1,010	860	1,190
26	1,010	.....	.....	.....	.....	8,420	18,000	10,500	3,870	1,010	1,090	1,090
27	930	.....	.....	.....	.....	7,560	15,600	9,870	4,350	1,010	1,010	1,090
28	18,000	.....	.....	.....	.....	9,290	12,600	9,000	3,870	1,010	1,010	1,090
29	860	.....	.....	.....	.....	8,420	12,000	8,710	3,180	930	1,010	1,090
30	860	.....	.....	.....	.....	7,280	13,000	7,840	3,180	860	1,010	860
31	860	.....	.....	.....	.....	7,560	.....	7,280	.....	860	1,010	.....

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Daily discharge, in second-feet, of Chippewa River at Chippewa Falls, Wis., for the years ending Sept. 30, 1888–1899—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1894-95.												
1	860	2,530	.....	.....	.....	.....	1,750	4,350	16,300	2,530	2,530	570
2	860	2,960	.....	.....	.....	.....	1,300	4,110	860	2,740	1,010	570
3	930	2,960	.....	.....	.....	.....	1,300	4,350	7,280	4,600	14,600	1,010
4	1,010	2,960	.....	.....	.....	.....	1,300	8,420	8,710	4,600	860	7,000
5	860	2,740	.....	.....	.....	.....	1,300	10,500	9,870	1,580	860	6,440
6	860	2,960	.....	.....	.....	.....	1,190	9,870	7,560	13,300	1,010	5,630
7	860	2,960	.....	.....	.....	.....	1,660	9,290	5,630	2,320	1,090	5,630
8	930	3,180	.....	.....	.....	.....	2,120	9,000	13,300	3,180	1,090	3,320
9	1,010	3,180	.....	.....	.....	.....	3,410	9,290	1,580	2,530	1,090	1,010
10	1,010	3,180	.....	.....	.....	.....	2,320	8,420	5,630	1,750	2,120	1,010
11	1,010	2,740	.....	.....	.....	.....	2,530	7,560	8,130	3,870	3,000	1,010
12	1,010	1,750	.....	.....	.....	.....	3,410	17,700	17,000	5,370	3,870	1,010
13	1,010	1,750	.....	.....	.....	.....	3,870	15,600	19,100	13,900	3,180	1,010
14	1,010	1,430	.....	.....	.....	.....	2,740	14,900	13,600	6,000	2,960	1,010
15	1,010	1,430	.....	.....	.....	.....	1,300	12,300	17,000	5,630	2,960	1,010
16	860	1,300	.....	.....	.....	.....	2,120	11,100	13,500	5,370	14,600	1,010
17	860	1,090	.....	.....	.....	.....	1,750	8,710	10,800	6,440	1,750	1,010
18	930	1,090	.....	.....	.....	.....	2,530	7,560	7,560	6,440	1,010	1,090
19	930	1,090	.....	.....	.....	.....	1,750	5,900	10,500	6,440	1,300	1,750
20	860	.....	.....	.....	.....	.....	1,190	17,000	4,850	6,440	1,010	1,750
21	860	.....	.....	.....	.....	.....	1,190	3,410	3,410	5,110	1,090	2,120
22	930	.....	.....	.....	.....	.....	1,190	4,600	13,300	5,630	2,740	3,640
23	1,010	.....	.....	.....	.....	.....	2,120	4,350	5,000	6,170	1,090	12,000
24	1,010	.....	.....	.....	.....	.....	1,300	3,870	4,850	6,440	1,090	15,900
25	1,430	.....	.....	.....	.....	.....	1,300	17,000	5,370	4,600	1,190	15,200
26	1,930	.....	.....	.....	.....	.....	1,580	1,010	7,560	4,600	1,300	12,300
27	1,580	.....	.....	.....	.....	.....	10,800	1,750	5,630	9,290	1,190	9,290
28	1,930	.....	.....	.....	.....	.....	2,000	2,530	4,350	1,010	1,190	5,110
29	3,180	.....	.....	.....	.....	.....	1,010	3,180	15,600	2,320	1,010	5,110
30	1,750	.....	.....	.....	.....	.....	2,960	2,320	2,530	3,180	620	5,110
31	2,320	.....	.....	.....	.....	.....	.....	3,410	.....	2,740	570	.....
1895-96.												
1	2,530	860	.....	.....	.....	.....	.....	19,100	8,710	4,350	3,180	1,750
2	1,750	670	.....	.....	.....	.....	.....	18,000	10,500	13,600	3,180	1,750
3	2,320	670	.....	.....	.....	.....	.....	21,600	9,870	1,750	3,180	1,750
4	2,530	670	.....	.....	.....	.....	.....	23,500	7,000	4,350	3,180	1,750
5	1,930	930	.....	.....	.....	.....	.....	20,500	7,000	4,350	3,180	1,750
6	1,750	1,010	.....	.....	.....	.....	.....	18,000	6,720	6,440	3,180	1,340
7	1,750	1,010	.....	.....	.....	.....	.....	15,600	14,900	6,440	2,740	930
8	1,750	1,010	.....	.....	.....	.....	.....	15,600	9,290	4,850	2,740	5,370
9	1,580	1,010	.....	.....	.....	.....	.....	9,290	13,900	12,300	2,800	2,960
10	1,010	1,010	.....	.....	.....	.....	.....	10,200	16,300	3,870	9,580	2,530
11	12,300	1,010	.....	.....	.....	.....	.....	13,300	13,300	4,350	4,350	2,120
12	1,300	1,010	.....	.....	.....	.....	.....	9,290	10,800	3,180	3,870	3,870
13	1,200	1,010	.....	.....	.....	.....	11,700	9,290	13,000	3,180	5,630	3,200
14	1,090	1,010	.....	.....	.....	.....	22,800	12,300	12,300	2,530	5,900	2,530
15	1,090	1,010	.....	.....	.....	.....	29,200	15,900	9,000	3,870	4,110	3,180
16	1,190	860	.....	.....	.....	.....	33,800	22,800	7,000	5,110	2,700	1,750
17	1,090	860	.....	.....	.....	.....	35,000	18,000	9,870	5,110	1,300	860
18	1,010	800	.....	.....	.....	.....	35,800	20,500	9,870	11,400	1,300	1,300
19	1,090	730	.....	.....	.....	.....	39,000	22,000	9,870	3,180	1,300	1,750
20	1,090	.....	.....	.....	.....	.....	38,600	20,500	16,300	3,410	1,300	2,360
21	1,010	.....	.....	.....	.....	.....	35,800	20,500	8,420	2,530	860	2,960
22	1,010	.....	.....	.....	.....	.....	29,500	12,300	7,560	2,530	2,530	2,530
23	1,010	.....	.....	.....	.....	.....	25,400	13,600	6,440	3,410	2,140	2,120
24	1,010	.....	.....	.....	.....	.....	21,600	12,300	7,560	3,180	1,750	2,320
25	1,010	.....	.....	.....	.....	.....	20,900	10,200	9,870	4,850	1,750	2,320
26	1,010	.....	.....	.....	.....	.....	20,500	11,400	10,500	3,180	1,840	4,350
27	1,010	.....	.....	.....	.....	.....	19,800	10,500	14,600	3,640	1,930	2,300
28	1,010	.....	.....	.....	.....	.....	21,600	9,870	4,850	2,740	1,930	2,120
29	930	.....	.....	.....	.....	.....	19,800	9,580	4,350	2,740	2,120	1,750
30	860	.....	.....	.....	.....	.....	19,800	15,600	4,850	3,180	2,120	1,750
31	730	.....	.....	.....	.....	.....	.....	7,000	.....	2,740	2,120	.....

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Daily discharge in second-feet of Chippewa River at Chippewa Falls, Wis., for the years ending Sept. 30, 1898–1930—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1906–07.												
1	[illegible]	[illegible]					[illegible]	[illegible]	5,630	11,400	13,000	2,120
2	[illegible]	[illegible]					[illegible]	[illegible]	6,440	9,870	11,400	2,120
3	[illegible]	[illegible]					[illegible]	[illegible]	13,000	7,560	9,870	3,870
4	[illegible]	[illegible]					[illegible]	[illegible]	[illegible]	9,870	9,870	3,870
5	[illegible]	[illegible]					[illegible]	[illegible]	9,290	26,500	7,560	9,290	3,870
6	[illegible]	[illegible]					[illegible]	9,290	16,200	7,000	7,000	3,870
7	[illegible]	[illegible]					[illegible]	[illegible]	14,000	7,000	7,000	3,870
8	[illegible]	[illegible]					[illegible]	7,560	15,000	5,630	6,440	3,870
9	[illegible]	[illegible]					[illegible]	6,440	13,000	2,530	6,440	16,200
10	[illegible]	[illegible]					[illegible]	7,560	13,000	7,290	5,630	3,180
11	[illegible]	[illegible]					[illegible]	[illegible]	14,000	2,120	4,850	3,180
12	[illegible]	4,156					[illegible]	[illegible]	14,200	4,350	4,850	1,080
13	[illegible]	[illegible]					[illegible]	7,560	11,400	4,350	4,850	3,870
14	[illegible]	[illegible]					[illegible]	7,560	10,400	2,530	4,850	4,350
15	1,200	[illegible]					[illegible]	14,200	9,870	3,180	7,000	4,850
16	1,750	[illegible]					[illegible]	6,440	15,000	2,530	3,180	4,350
17	1,[illegible]	[illegible]					[illegible]	4,350	10,900	2,530	3,640	3,180
18	2,[illegible]	[illegible]					[illegible]	5,630	20,500	1,750	3,180	3,180
19	2,130	[illegible]					[illegible]	5,630	21,400	3,180	3,180	3,180
20	2,130	[illegible]				25,000	14,900	10,300	17,300	2,530	3,180	3,180
21	2,130	[illegible]				24,000	13,000	16,200	16,200	3,180	13,000	3,180
22	2,130	[illegible]				25,400	13,000	22,000	11,400	2,530	2,530	3,180
23	2,130	[illegible]				26,100	13,000	13,000	11,400	3,870	3,180	2,740
24	1,750	[illegible]				27,400	13,900	13,000	11,100	3,870	2,740	2,530
25	1,750	[illegible]				26,500	13,000	13,000	10,200	3,870	3,180	2,530
26	1,750	[illegible]				27,200	11,700	13,000	9,200	4,850	2,530	1,300
27	1,750	[illegible]				25,400	12,000	12,300	6,440	15,000	2,530	1,300
28	1,750	[illegible]				26,500	10,900	10,500	6,440	20,500	2,530	4,110
29	1,750	[illegible]				29,900	12,300	16,300	8,420	18,000	1,300	2,130
30	4,350	[illegible]				33,400	15,200	3,180	10,500	18,000	1,300	2,120
31	5,630	[illegible]				46,500	[illegible]	4,350	[illegible]	13,600	2,120	[illegible]
1907–08.												
1	2,530	2,530					9,290	6,440	9,290	7,560	2,120	2,120
2	2,530	2,530					8,420	6,440	9,290	7,560	2,120	2,120
3	2,130	2,530					7,560	9,290	7,840	7,560	2,120	2,120
4	2,530	2,530					7,000	9,870	17,000	7,560	2,120	1,300
5	2,120	2,530					6,440	9,290	2,530	7,560	2,120	1,300
6	3,640	2,530					5,630	8,420	4,350	7,560	2,120	1,750
7	3,180	2,530					4,350	13,900	3,180	7,560	5,900	1,750
8	2,120	2,530					4,350	3,870	7,000	9,870	2,530	2,120
9	7,640	2,530					4,350	3,180	9,290	13,900	2,120	1,300
10	1,750	2,530					4,350	7,000	7,000	3,640	1,750	1,300
11	1,750	2,530					4,350	7,000	17,700	4,350	1,300	1,300
12	1,750	2,530					4,850	7,000	3,180	5,630	1,300	2,120
13	2,120	2,530					5,630	6,440	3,870	5,630	1,300	1,750
14	1,750	2,120					7,000	13,600	9,290	4,850	3,410	2,120
15	1,750	2,120					6,440	3,180	9,870	4,350	2,120	1,560
16	3,180	2,120					5,630	3,180	11,400	9,290	2,120	1,750
17	4,350	2,530					5,630	3,870	9,870	1,300	2,120	2,120
18	5,630	2,120					4,850	4,350	14,200	2,120	5,630	2,120
19	5,630	2,120					7,000	4,850	7,000	2,120	3,180	2,120
20	5,630	2,120					5,630	5,630	4,350	3,180	3,180	2,080
21	5,110	2,120					7,000	15,000	5,630	3,870	2,530	1,940
22	4,850	2,120					7,560	4,350	6,440	3,180	3,180	1,840
23	17,300	[illegible]					14,000	4,350	6,440	9,870	2,530	1,750
24	3,640	[illegible]					10,500	3,870	6,440	1,010	2,120	1,750
25	4,350	[illegible]					9,870	5,630	12,300	2,120	2,530	860
26	4,350	[illegible]					9,290	6 440	3,870	2,120	2,120	2,120
27	3,180	[illegible]					8,420	4,350	4,350	2,120	2,120	2,120
28	3,180	[illegible]					7,560	19,100	7,000	2,120	2,120	2,010
29	3,180	[illegible]				8,420	7,560	13,900	8,420	2,530	2,120	1,900
30	2,530	[illegible]				9,870	7,000	12,300	7,560	2,120	2,120	1,800
31	2,530	[illegible]				10,500	[illegible]	10,500	[illegible]	2,120	2,120	[illegible]

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Daily discharge, in second-feet, of Chippewa River at Chippewa Falls, Wis., for the years ending Sept. 30, 1888–1899—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1898–99.												
1	1,690	1,750	.....	.....	.....	.....	.....	21,600	5,510	15,500	3,290	2,390
2	1,580	1,750	.....	.....	.....	.....	.....	22,300	7,800	2,030	18,400	2,030
3	2,120	1,750	.....	.....	.....	.....	.....	22,300	15,600	3,500	2,030	2,030
4	2,120	2,120	.....	.....	.....	.....	.....	23,300	8,300	3,870	2,560	2,030
5	2,120	1,750	.....	.....	.....	.....	.....	19,400	10,000	4,280	3,110	2,390
6	2,120	1,750	.....	.....	.....	.....	.....	27,200	12,400	4,880	1,660	2,390
7	2,120	1,750	.....	.....	.....	.....	.....	15,300	12,400	4,690	3,110	2,390
8	2,120	1,750	.....	.....	.....	.....	.....	11,400	12,200	12,300	3,110	2,390
9	2,120	1,750	.....	.....	.....	.....	.....	10,600	15,300	570	3,110	2,560
10	2,120	2,120	.....	.....	.....	.....	5,950	8,300	18,400	3,110	3,110	2,740
11	2,320	1,750	.....	.....	.....	.....	7,330	7,800	6,850	3,870	3,110	3,500
12	2,320	1,750	.....	.....	.....	.....	7,680	9,800	5,510	3,870	2,740	3,680
13	2,530	1,750	.....	.....	.....	.....	11,300	17,000	12,400	10,300	2,030	3,500
14	2,530	1,750	.....	.....	.....	.....	17,500	3,870	14,700	1,500	2,030	3,500
15	3,180	1,750	.....	.....	.....	.....	16,600	4,280	20,400	1,800	3,110	2,740
16	2,530	1,750	.....	.....	.....	.....	17,800	6,160	19,100	2,030	2,030	10,600
17	2,740	1,750	.....	.....	.....	.....	17,800	11,400	15,600	2,740	2,030	1,800
18	3,180	1,750	.....	.....	.....	.....	13,900	17,500	10,200	1,120	2,030	2,030
19	2,530	1,750	.....	.....	.....	.....	13,000	18,400	9,050	1,120	17,000	2,560
20	2,530	1,750	.....	.....	.....	.....	13,000	25,800	12,200	2,200	3,110	2,560
21	2,530	1,750	.....	.....	.....	.....	13,900	9,800	9,800	2,930	3,110	2,030
22	2,530	.....	.....	.....	.....	.....	13,900	10,800	9,800	2,930	2,560	2,030
23	2,420	.....	.....	.....	.....	.....	12,400	9,290	8,810	2,930	2,740	2,030
24	2,320	.....	.....	.....	.....	.....	11,400	7,560	18,600	3,290	2,390	2,210
25	1,750	.....	.....	.....	.....	.....	9,800	7,560	3,870	4,280	2,390	2,390
26	1,750	.....	.....	.....	.....	.....	9,050	6,850	3,870	4,280	2,030	2,200
27	1,750	.....	.....	.....	.....	.....	5,110	15,000	4,280	3,870	2,030	2,030
28	1,750	.....	.....	.....	.....	.....	9,800	8,300	4,880	3,870	2,740	2,030
29	1,750	.....	.....	.....	.....	.....	26,200	9,800	5,010	2,390	2,390	2,200
30	1,750	.....	.....	.....	.....	.....	12,400	8,300	5,720	2,840	2,390	2,200
31	1,750	.....	.....	.....	.....	.....	.....	9,050	.....	3,290	2,390	.....

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Daily discharge, in second-feet, of Chippewa River at Chippewa Falls, Wis., for the years ending Sept. 30, 1910–1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1909–10.												
1	2,120	3,870	10,500	7,000	3,300	2,740	6,440	4,850	4,110	1,580	1,930	1,750
2	2,120	4,350	9,580	7,000	3,180	2,960	6,170	5,110	3,870	2,740	1,430	2,120
3	1,930	8,130	8,710	7,000	2,960	2,740	5,630	4,110	3,870	1,580	1,580	2,320
4	1,840	9,870	9,290	6,720	2,850	2,960	5,370	3,870	9,290	1,930	1,750	1,930
5	2,220	9,580	8,130	6,440	2,740	2,960	5,630	3,640	3,640	2,530	1,930	1,580
6	2,220	9,000	7,560	6,440	2,640	3,070	5,900	3,870	4,110	1,580	1,580	2,220
7	2,320	8,130	7,000	6,170	2,530	3,300	6,170	3,640	3,410	790	860	3,410
8	2,220	7,000	6,440	6,170	2,530	3,410	5,900	3,410	3,180	730	1,750	3,180
9	2,220	6,440	6,440	6,440	2,850	3,520	6,170	3,180	3,180	670	1,580	2,530
10	2,020	5,370	6,440	6,440	2,850	3,760	5,110	2,960	2,960	620	1,190	2,120
11	2,530	4,350	6,170	7,000	2,530	3,990	4,350	2,960	2,740	790	1,300	1,750
12	3,180	4,600	5,900	6,440	2,530	4,110	4,600	2,960	2,120	620	860	2,530
13	3,180	6,440	5,900	5,900	2,960	4,110	4,110	2,740	2,530	570	1,010	2,120
14	3,410	13,600	5,900	5,630	2,850	3,990	3,870	2,960	2,320	2,120	860	2,320
15	3,300	21,300	5,630	5,630	2,740	3,760	4,110	2,120	2,740	620	1,010	2,530
16	3,300	20,500	5,900	5,370	2,740	3,640	3,870	2,740	2,120	570	1,430	2,740
17	3,070	18,400	6,170	5,370	2,640	3,300	3,410	2,960	2,530	490	1,300	2,530
18	3,180	14,200	5,630	4,850	2,530	3,300	3,180	4,850	2,740	670	1,580	1,300
19	3,300	11,400	5,900	4,350	2,530	3,870	4,600	8,420	2,120	620	1,750	3,410
20	3,070	11,700	7,000	4,230	2,740	4,350	5,370	9,870	2,740	570	1,930	3,180
21	2,960	11,700	6,720	3,640	2,740	4,850	9,580	8,710	2,320	530	1,010	1,190
22	3,520	9,580	6,440	3,300	2,320	8,130	8,710	9,000	2,120	530	1,090	1,090
23	3,410	7,280	7,000	3,180	2,420	7,840	7,560	9,290	1,750	570	1,580	2,120
24	3,640	7,560	7,000	3,070	2,850	7,000	6,440	9,000	2,120	460	1,430	1,930
25	3,640	7,280	6,440	3,070	2,960	8,130	6,720	8,420	2,320	790	1,580	1,300
26	3,870	7,560	7,000	3,520	2,740	8,130	7,560	8,130	1,580	2,120	1,430	2,530
27	4,110	8,130	7,000	3,760	2,740	7,840	5,630	7,840	2,120	2,320	1,300	1,930
28	3,870	9,580	7,000	3,870	2,960	7,000	5,900	7,000	2,120	2,530	860	2,120
29	3,870	11,700	6,440	3,640	.....	7,000	5,370	5,110	1,750	2,320	1,930	1,930
30	3,870	12,300	7,000	3,410	.....	7,000	5,630	2,530	1,580	1,750	2,120	2,120
31	3,410	.....	7,000	3,410	.....	6,440	.....	4,350	.....	1,010	1,930	.....
1910–11.												
1	2,530	1,580	1,580	1,580	1,930	1,580	5,370	4,110	3,870	1,300	.....	.....
2	2,320	1,580	1,580	1,580	1,750	1,580	5,110	4,110	4,850	1,190	.....	.....
3	2,320	1,580	1,430	1,580	1,580	1,580	4,600	4,110	4,850	1,190	.....	.....
4	2,420	1,580	1,360	1,580	1,580	1,580	4,350	4,350	4,850	1,430	.....	.....
5	2,530	1,580	1,300	1,580	1,660	1,580	3,870	4,350	5,900	1,750	.....	.....
6	2,640	1,580	1,300	1,580	1,840	1,580	3,870	4,110	9,870	1,580	.....	.....
7	2,530	1,580	1,360	1,580	1,930	1,660	3,640	4,110	10,200	1,580	.....	.....
8	2,420	1,580	1,430	1,580	1,750	1,750	3,640	4,110	6,440	1,580	.....	.....
9	2,320	1,580	1,360	1,580	1,750	1,750	3,640	2,960	5,630	1,750	.....	.....
10	2,420	1,580	1,300	1,580	1,580	1,930	3,410	3,180	5,370	2,120	.....	.....
11	2,320	1,580	1,300	1,580	1,580	2,120	3,870	4,350	3,870	2,120	.....	.....
12	2,420	1,580	1,300	1,580	1,580	2,850	2,530	3,640	3,870	2,120	.....	.....
13	2,320	1,580	1,300	1,580	1,580	3,180	6,170	2,740	2,740	1,750	.....	.....
14	2,320	1,500	1,300	1,580	1,580	2,850	8,420	2,740	2,530	1,750	.....	.....
15	2,320	1,430	1,300	1,580	1,580	2,960	5,370	3,640	3,410	1,300	.....	.....
16	1,360	1,430	1,300	1,580	1,580	3,410	7,000	4,110	2,740	1,090	.....	.....
17	2,320	1,430	1,300	1,580	1,580	3,640	6,440	4,110	2,530	1,190	.....	.....
18	1,300	1,430	1,300	1,580	1,580	3,640	5,900	4,110	2,320	1,090	.....	.....
19	1,500	1,430	1,430	1,580	1,750	3,640	5,630	4,110	2,320	1,090	.....	.....
20	1,750	1,300	1,580	1,580	1,750	3,410	5,900	4,350	1,930	1,190	.....	.....
21	1,750	1,300	1,750	1,580	1,750	3,300	8,130	7,280	1,750	1,190	.....	.....
22	1,430	1,300	1,580	1,580	1,750	3,410	6,440	10,500	1,750	1,190	.....	.....
23	1,580	1,300	1,430	1,580	1,750	3,520	6,170	9,870	1,580	1,090	.....	.....
24	1,580	1,300	1,580	1,580	1,750	3,990	6,440	11,400	1,580	1,190	.....	.....
25	1,580	1,300	1,580	1,580	1,750	4,350	5,900	11,400	1,580	1,190	.....	.....
26	1,580	1,300	1,580	1,580	1,580	4,600	5,110	9,290	1,580	1,300	.....	.....
27	1,580	1,300	1,430	1,580	1,580	4,600	5,370	7,000	1,580	1,300	.....	.....
28	1,580	1,360	1,430	1,580	1,580	4,350	4,600	6,440	1,430	1,300	.....	.....
29	1,580	1,430	1,430	2,120	.....	6,440	3,870	5,630	1,430	1,430	.....	.....
30	1,580	1,500	1,580	2,120	.....	6,170	4,110	4,600	1,300	1,090	.....	.....
31	1,580	.....	1,580	2,120	.....	6,440	.....	3,870	.....	1,300	.....	.....

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Daily discharge, in second-feet, of Chippewa River at Chippewa Falls, Wis., for the years ending Sept. 30, 1910–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1911–12.												
1	2,220	4,350	.....	.....	.....	.....	4,850	12,300	10,800	2,530	.....	.....
2	2,320	3,300	.....	.....	.....	.....	5,110	10,800	9,870	2,120	.....	.....
3	4,350	2,220	.....	.....	.....	.....	6,170	9,870	9,290	2,120	.....	.....
4	7,280	2,220	.....	.....	.....	.....	6,170	11,400	7,560	2,980	.....	.....
5	7,280	2,220	.....	.....	.....	.....	9,000	20,500	7,560	2,530	.....	.....
6	21,600	2,220	.....	.....	.....	.....	13,600	28,800	7,000	2,120	.....	.....
7	33,400	2,220	.....	.....	.....	.....	17,300	28,800	6,440	2,120	.....	.....
8	33,000	2,220	.....	.....	.....	.....	22,400	23,900	5,900	2,120	.....	.....
9	25,400	2,320	.....	.....	.....	.....	21,300	19,800	5,900	2,120	.....	.....
10	18,000	2,320	.....	.....	.....	.....	17,300	15,600	4,850	2,530	.....	.....
11	14,600	2,320	.....	.....	.....	.....	14,600	13,000	4,350	2,120	.....	.....
12	10,200	2,320	.....	.....	.....	.....	13,000	10,500	3,870	2,120	.....	.....
13	7,280	2,320	.....	.....	.....	.....	12,300	9,580	3,520	2,740	.....	.....
14	7,280	2,220	.....	.....	.....	.....	12,000	8,130	3,640	2,530	.....	.....
15	7,000	2,220	.....	.....	.....	.....	12,600	7,280	3,870	2,530	.....	.....
16	8,420	2,220	.....	.....	.....	.....	13,300	7,000	3,640	2,120	.....	.....
17	16,300	.....	.....	.....	.....	.....	14,600	6,440	3,990	2,120	.....	.....
18	18,400	.....	.....	.....	.....	.....	12,000	7,000	4,110	1,930	.....	.....
19	20,200	.....	.....	.....	.....	.....	12,000	6,170	5,110	1,930	.....	.....
20	16,600	.....	.....	.....	.....	.....	10,500	6,440	4,850	1,930	.....	.....
21	14,600	.....	.....	.....	.....	.....	9,000	6,170	4,850	1,580	.....	.....
22	13,000	.....	.....	.....	.....	.....	12,300	6,440	4,350	1,580	.....	.....
23	10,200	.....	.....	.....	.....	.....	17,000	23,500	3,870	1,580	.....	.....
24	9,870	.....	.....	.....	.....	.....	16,300	27,600	3,870	2,530	.....	.....
25	8,420	.....	.....	.....	.....	.....	13,000	20,500	3,870	3,870	.....	.....
26	7,280	.....	.....	.....	.....	.....	13,000	14,900	3,410	12,300	.....	.....
27	7,000	.....	.....	.....	.....	.....	14,200	12,000	3,070	9,000	.....	.....
28	7,000	.....	.....	.....	.....	.....	16,300	20,500	2,850	6,170	.....	.....
29	4,600	.....	.....	.....	.....	.....	17,000	23,500	2,640	5,110	.....	.....
30	4,350	.....	.....	.....	.....	.....	14,600	20,500	2,120	3,640	.....	.....
31	4,350	.....	.....	.....	.....	.....	.....	16,300	.....	3,180	.....	.....
1912–13.												
1	.....	.....	.....	.....	.....	.....	13,600	11,400	9,870	2,120	7,000	3,180
2	.....	.....	.....	.....	.....	.....	20,500	11,400	9,870	2,120	4,850	2,420
3	.....	.....	.....	.....	.....	.....	31,100	9,870	8,420	1,500	4,350	2,420
4	.....	.....	.....	.....	.....	.....	35,000	9,290	9,420	2,120	4,350	3,180
5	.....	.....	.....	.....	.....	.....	31,100	9,290	7,000	7,840	3,870	3,870
6	.....	.....	.....	.....	.....	.....	23,500	8,420	5,110	22,400	3,640	3,180
7	.....	.....	.....	.....	.....	.....	22,400	7,560	5,110	20,500	3,180	3,640
8	.....	.....	.....	.....	.....	.....	18,700	7,000	9,870	16,300	3,180	2,850
9	.....	.....	.....	.....	.....	.....	17,000	6,440	9,290	13,600	2,850	2,850
10	.....	.....	.....	.....	.....	.....	14,600	5,630	7,840	13,600	2,850	2,850
11	.....	.....	.....	.....	.....	.....	13,900	6,170	7,000	12,300	2,420	2,850
12	.....	.....	.....	.....	.....	.....	11,400	6,170	6,440	12,300	2,420	2,420
13	.....	.....	.....	.....	.....	.....	13,600	5,110	6,170	9,870	2,850	2,420
14	.....	.....	.....	.....	.....	.....	16,300	5,110	5,630	9,870	2,850	2,420
15	.....	.....	.....	.....	.....	.....	17,300	5,110	5,110	9,290	2,420	2,420
16	.....	.....	.....	.....	.....	.....	20,500	6,170	5,110	8,420	2,120	2,420
17	.....	.....	.....	.....	.....	.....	18,000	7,840	4,350	9,000	2,120	2,420
18	.....	.....	.....	.....	.....	.....	22,400	10,800	4,350	7,840	2,120	2,120
19	.....	.....	.....	.....	.....	.....	22,800	12,000	4,350	7,560	3,180	1,840
20	.....	.....	.....	.....	.....	.....	21,600	12,000	4,350	8,420	7,840	2,120
21	.....	.....	.....	.....	.....	.....	19,800	13,000	3,870	7,560	7,840	2,420
22	.....	.....	.....	.....	.....	.....	18,000	17,300	3,180	6,440	7,840	3,180
23	.....	.....	.....	.....	.....	.....	17,000	19,100	2,850	5,110	6,170	3,180
24	.....	.....	.....	.....	.....	.....	17,000	17,300	2,850	4,850	5,630	3,640
25	.....	.....	.....	.....	.....	.....	16,300	13,900	3,640	4,850	4,350	3,640
26	.....	.....	.....	.....	.....	.....	16,300	13,000	2,420	4,350	4,350	4,850
27	.....	.....	.....	.....	.....	.....	15,600	10,800	2,420	4,350	3,640	5,110
28	.....	.....	.....	.....	.....	.....	13,900	9,000	2,120	4,850	3,640	5,630
29	.....	.....	.....	.....	.....	.....	13,000	9,290	2,120	7,000	2,850	5,110
30	.....	.....	.....	.....	.....	.....	13,000	9,870	2,120	7,560	2,420	4,350
31	.....	.....	.....	.....	.....	.....	.....	9,870	.....	8,420	3,180	.....

NOTE.—Daily discharge computed from a rating curve fairly well defined above 1,930 second-feet (gage height 0.9 foot). Below 1,930 second-feet the rating curve is simply an extension and estimates of discharge below this value should therefore be used with extreme caution. See "Gage," in station description.

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Monthly discharge of Chippewa River at Chippewa Falls, Wis., for the years ending Sept. 30, 1888–1913.

Month.	Discharge in second-feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
1888.				
July	24,200	2,960	6,620	.....
August	15,900	3,640	8,330	.....
September	5,110	2,740	3,310	.....
1888–89.				
October	4,850	1,750	3,240	.....
April	18,400	3,180	6,580	.....
May	22,800	3,870	11,300	.....
June	19,800	2,120	9,500	.....
July	17,000	1,430	4,730	.....
August	13,000	1,090	2,580	.....
September	17,000	1,300	2,740	.....
1889–90.				
October	2,120	860	1,380	.....
April 4–30	27,200	5,630	15,400	.....
May	21,600	1,300	8,630	.....
June	19,800	1,580	10,500	.....
July	13,300	1,580	4,320	.....
August	14,600	1,750	5,750	.....
September	14,600	1,930	6,800	.....
1890–91.				
October	20,200	1,750	4,940	.....
November 1–10	5,110	1,580	2,510	.....
April 13–30	27,200	7,840	19,900	.....
May	17,700	2,000	6,930	.....
June	14,600	1,300	3,870	.....
July	12,300	860	1,860	.....
August	3,870	860	1,300	.....
September	5,110	670	979	.....
1891–92.				
October	13,900	730	2,180	.....
November 1–16	2,000	1,010	1,190	.....
April	20,500	1,300	8,170	.....
May	35,800	1,010	16,100	.....
June	28,800	7,560	13,400	.....
July	19,100	1,010	7,550	.....
August	14,900	860	2,600	.....
September	2,740	1,010	1,530	.....
1892–93.				
October	1,300	860	1,020	.....
November 1–9	1,090	1,010	1,070	.....
April 3–30	27,600	6,440	15,300	.....
May	38,200	10,800	21,100	.....
June	16,600	860	6,030	.....
July	15,900	930	3,970	.....
August	3,180	1,010	1,320	.....
September	1,190	930	1,020	.....
1893–94.				
October	19,800	860	2,610	.....
March 5–31	22,400	5,510	10,200	.....
April	32,700	4,850	15,300	.....
May	47,300	7,280	18,900	.....
June	18,400	860	4,610	.....
July	2,530	860	1,360	.....
August	1,750	860	1,120	.....
September	1,190	860	1,030	.....
1894–95.				
October	3,180	860	1,180	.....
November 1–19	3,180	1,090	2,280	.....
April	10,800	1,010	2,210	.....
May	17,700	1,010	7,850	.....
June	19,100	860	8,880	.....
July	13,900	1,010	5,040	.....
August	14,600	570	2,420	.....
September	15,900	570	4,320	.....

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Monthly discharge of Chippewa River at Chippewa Falls, Wis., for the years ending Sept. 30, 1888–1915—Continued.

Month.	Discharge in second-feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
1895-96.				
October	12,300	730	1,680	.....
November 1-19	1,010	670	903	.....
April 13-30	39,000	11,700	26,700	.....
May	23,500	7,000	15,100	.....
June	16,300	4,350	9,820	.....
July	13,600	1,750	4,590	.....
August	9,580	860	2,900	.....
September	5,370	860	2,310	.....
1896-97.				
October	5,630	1,300	2,020	.....
November 1-12	10,200	4,350	8,160	.....
March 20-31	46,500	24,600	28,900	.....
April	60,100	10,800	21,700	.....
May	22,000	3,180	10,200	.....
June	26,500	5,630	13,100	.....
July	20,500	1,750	6,860	.....
August	13,600	1,300	5,360	.....
September	16,300	1,090	3,550	.....
1897-98.				
October	17,300	1,750	3,810	.....
November 1-22	2,530	2,120	2,380	.....
April	14,600	4,350	6,940	.....
May	19,100	3,180	7,650	.....
June	17,700	2,530	7,860	.....
July	13,900	1,010	5,040	.....
August	5,900	1,300	2,460	.....
September	2,120	1,300	860	.....
1898-99.				
October	3,180	1,580	2,220	.....
November 1-21	2,120	1,750	1,790	.....
April 10-30	26,200	5,110	12,700	.....
May	27,200	3,870	13,100	.....
June	20,400	3,870	10,600	.....
July	15,500	570	3,940	.....
August	18,400	1,660	3,540	.....
September	10,600	1,800	2,710	.....
1899-1900.				
October	20,800	1,300	4,710	.....
November	5,950	2,560	3,480	.....
April 7-30	40,400	4,690	16,000	.....
May	17,500	2,560	7,180	.....
June	10,700	1,660	2,610	.....
July	23,300	2,120	6,810	.....
August	29,800	3,110	9,800	.....
September	44,800	5,510	17,700	.....
1900-01.				
October	45,500	4,280	15,600	.....
November 1-24	31,300	4,880	11,500	.....
March 26-31	9,800	7,950	8,870	.....
April	21,300	5,510	14,800	.....
May	17,300	3,110	6,480	.....
June	16,600	2,030	5,210	.....
July	15,000	1,700	7,900	.....
August	18,400	2,030	5,490	.....
September	6,850	2,030	3,030	.....
1901-02.				
October	16,600	1,300	5,270	.....
November 1-19	5,510	2,030	3,710	.....
March 10-31	8,060	3,680	6,330	.....
April	23,300	2,030	6,830	.....
May	17,000	3,870	9,470	.....
June	23,300	2,000	6,960	.....
July	15,000	1,700	5,160	.....
August	8,420	1,540	2,250	.....
September	8,780	1,700	2,300	.....

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Monthly discharge of Chippewa River at Chippewa Falls, Wis., for the years ending Sept. 30, 1888–1913—Continued.

Month.	Discharge in second-feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
1902–03.				
October	6,630	1,700	2,530	.....
November	28,200	4,000	9,880	.....
December 1–9	3,870	2,030	2,730	.....
March 18–31	32,800	8,300	17,100	.....
April	26,600	6,630	10,200	.....
May	41,900	13,700	22,700	.....
June	25,600	1,300	7,050	.....
July	34,700	2,030	12,400	.....
August	22,600	3,000	6,900	.....
September	45,900	4,280	16,400	.....
1903–04.				
October	24,200	4,280	11,700	.....
November 1–19	4,280	2,560	3,330	.....
April 6–30	20,500	8,540	12,900	.....
May	33,300	6,850	15,100	.....
June	21,400	4,280	11,000	.....
July	20,400	3,000	7,220	.....
August	11,500	1,300	2,900	.....
September	23,300	1,300	7,390	.....
1904–05.				
October	39,600	3,110	14,600	.....
November	13,900	2,560	4,690	.....
March, 23–31	30,200	4,280	14,900	.....
April	25,400	2,450	9,720	A.
May	26,600	4,760	11,800	A.
June	64,400	4,760	21,600	A.
July	27,000	3,110	9,530	A.
August	8,600	2,450	4,780	A.
September	22,300	3,340	7,650	A.
1905–06.				
October	14,700	2,560	7,890	.....
November	6,160	3,680	4,870	.....
December, 1–21	5,510	4,280	4,630	.....
April	38,500	10,300	23,400	.....
May	22,000	3,110	11,400	.....
June	24,100	2,000	8,660	.....
July	13,000	1,700	4,660	.....
August	16,800	1,870	5,820	.....
September	19,400	1,700	5,930	.....
1906–07.				
October	13,300	2,030	5,780	.....
November	9,290	4,280	7,050	.....
March, 17–31	36,400	3,570	15,200	A.
April	30,200	6,300	13,900	A.
May	18,800	8,000	11,400	A.
June	9,800	4,520	6,280	A.
July	8,300	2,030	3,970	A.
August	2,670	1,750	2,230	A.
September	32,300	1,430	8,220	A.
1907–08.				
October	6,300	2,240	3,240	A.
November	3,110	1,830	2,630	A.
December	.....	.....	1,600	C.
January	.....	.....	1,360	C.
February	.....	.....	1,300	C.
March	3,800	.....	1,950	B.
April	27,800	2,890	12,300	A.
May	24,200	7,710	15,700	A.
June	18,400	4,040	8,880	A.
July	5,260	2,670	3,670	A.
August	4,040	2,030	2,730	A.
September	2,670	1,430	1,990	A.
The year	27,800	.....	4,780	

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Monthly discharge of Chippewa River at Chippewa Falls, Wis., for the years ending Sept. 30, 1888–1915—Continued.

Month.	Discharge in second-feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
1908–09.				
October	2,890	1,580	2,200	A.
November	2,890	1,750	2,210	A.
December	.....	.....	1,500	D.
January	.....	.....	1,360	C.
February	.....	.....	1,180	C.
March	.....	.....	1,250	C.
April	16,600	.....	7,820	B.
May	26,200	4,760	15,200	A.
June	21,900	3,800	8,020	A.
July	9,800	1,830	4,060	A.
August	6,300	2,030	3,600	A.
September	3,110	1,750	2,360	A.
The year	26,200	.....	4,250	
1909–10.				
October	4,110	1,840	3,000	A.
November	21,300	3,870	9,700	A.
December	10,500	5,630	6,940	B.
January	7,000	3,070	5,110	C.
February	3,300	2,320	2,750	D.
March	8,130	2,740	4,810	C.
April	9,580	3,180	5,640	B.
May	9,870	2,120	5,180	A.
June	9,290	1,580	2,870	B.
July	2,740	460	1,200	D.
August	2,120	860	1,450	C.
September	3,410	1,090	2,200	B.
The year	21,300	460	4,240	
1910–11.				
October	2,640	1,300	1,990	B.
November	1,580	1,300	1,460	C.
December	1,750	1,300	1,430	C.
January	2,120	1,580	1,630	D.
February	1,930	1,580	1,680	D.
March	6,440	1,580	3,210	C.
April	8,420	2,530	5,160	B.
May	11,400	2,740	5,310	B.
June	10,200	1,300	3,520	B.
July	2,120	1,090	1,410	C.
1911–12.				
October	33,400	2,220	12,000	B.
November 1–16	4,350	2,220	2,450	B.
April	22,400	4,850	13,100	A.
May	28,800	6,170	14,700	A.
June	10,800	2,120	5,030	B.
July	12,300	1,580	3,090	B.
1912–13.				
April	35,000	11,400	18,800	A.
May	19,100	5,110	9,850	A.
June	9,870	2,120	5,380	B.
July	22,400	1,500	8,460	A.
August	7,840	2,120	2,950	B.
September	5,630	1,840	3,170	B.

NOTE.—Monthly discharge values for the years ending Sept. 30, 1899–1909 differ from those previously published in the United States Geological Survey Water Supply Papers on account of revising the daily discharge estimates for stages below gage height 0.8 foot.

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RED CEDAR RIVER AT CEDAR FALLS, WIS.

Location.—At a highway bridge in the vicinity of Cedar Falls, Wis., immediately below the power plant of the Chippewa Valley Railway, Light & Power Co., 4½ miles above the crossing of the Chicago, St. Paul, Minneapolis & Omaha Railway.

Records available.—April 1, 1909, to September 30, 1913.

Drainage area.—Not measured.

Gage.—Staff gage fastened to bridge pier; read morning and evening to tenths.

Channel and control.—Heavy gravel and probably permanent.

Discharge measurements.—None have been made at this station.

Winter flow.—Practically no ice forms in the vicinity of the gage, owing to high temperature of the water coming from the reservoir.

Regulation.—Daily fluctuations caused by operation of the power plant above the gage.

Cooperation.—All gage heights furnished by the Chippewa Valley Railway, Light & Power Co.

Daily gage height, in feet, of Red Cedar River at Cedar Falls, Wis., for the year ending Sept. 30, 1913.

[Frank Wilkinson, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.6	2.3	2.2	2.6	2.6	2.5	5.5	2.9	2.8	2.3	2.55	2.4
2	2.6	2.3	2.2	2.5	2.0	2.0	5.55	2.9	2.9	2.0	2.5	2.4
3	2.6	2.4	2.3	2.5	2.6	2.5	5.6	3.0	2.85	2.0	2.3	2.4
4	2.6	2.4	2.3	2.5	2.6	2.6	5.75	2.5	2.8	1.45	2.4	2.6
5	2.6	2.5	2.4	2.0	2.5	2.5	5.55	2.8	2.8	2.1	2.4	2.6
6	2.5	2.5	2.3	2.4	2.5	2.5	4.8	2.8	2.75	4.0	2.45	2.5
7	2.5	2.5	2.2	2.4	2.4	2.45	4.35	2.8	2.7	4.2	2.4	2.4
8	2.5	2.5	2.2	2.5	2.45	2.5	4.15	2.75	2.65	3.9	2.4	2.4
9	2.5	2.5	2.4	2.5	1.6	2.0	3.85	2.7	2.6	3.55	2.4	2.4
10	2.5	2.5	2.3	2.4	2.5	2.8	3.3	2.7	2.6	3.2	2.3	2.4
11	2.5	2.5	2.35	2.3	2.4	2.55	3.6	2.0	2.5	3.0	2.4	2.4
12	2.7	2.6	2.4	2.1	2.45	3.35	3.7	2.3	2.5	3.2	2.4	2.5
13	2.8	2.4	2.4	2.3	2.45	3.8	3.5	2.4	2.5	2.6	2.3	2.4
14	2.9	2.5	2.4	2.3	2.45	4.4	3.5	2.5	2.5	2.9	2.4	2.1
15	2.8	2.5	[a].6	2.4	2.5	4.4	3.5	2.75	2.6	3.0	2.4	2.4
16	2.8	2.5	2.4	2.4	1.6	3.95	3.5	2.95	2.7	3.0	2.4	2.35
17	2.7	2.4	2.4	2.4	2.4	3.8	3.5	3.05	2.7	3.1	2.3	2.4
18	2.6	2.4	2.4	2.3	2.4	3.35	3.5	3.3	2.6	3.1	2.4	2.4
19	2.6	2.4	2.3	2.3	2.45	3.25	3.5	3.45	2.6	3.1	2.4	2.4
20	2.6	2.4	2.4	2.4	2.45	4.05	3.35	3.6	2.6	2.7	2.4	2.4
21	2.5	2.4	2.5	2.4	2.4	4.1	3.3	4.0	2.6	2.65	2.4	2.4
22	2.4	2.4	2.4	2.3	2.5	3.9	3.3	4.05	2.25	2.6	2.5	2.4
23	2.4	2.4	2.4	2.4	1.8	4.15	3.3	4.0	2.65	2.6	2.45	2.4
24	2.3	2.3	2.5	2.4	2.3	4.4	3.3	3.8	2.6	2.6	2.25	2.5
25	2.3	2.3	2.5	2.4	2.45	4.4	3.2	3.45	2.6	2.6	2.4	2.5
26	2.3	2.3	2.6	2.0	2.4	4.15	3.2	3.35	2.6	2.6	2.4	2.6
27	2.3	2.2	2.5	2.4	2.45	4.1	2.8	3.3	2.6	2.4	2.4	2.5
28	2.3	2.2	2.5	2.5	2.4	3.9	3.1	3.25	2.6	2.6	2.4	2.3
29	2.3	2.2	[a]1.6	2.6	.....	4.2	3.1	3.2	2.4	2.9	2.4	2.4
30	2.3	2.3	2.5	2.5	.....	5.1	3.0	3.1	2.6	2.65	2.4	2.4
31	2.3	.....	2.5	2.4	.....	.....	.....	3.0	.....	2.55	2.4	.....

[a] Turbines in power house above the station shut down.

NOTE.—Discharge relation probably not affected by ice during the year ending Sept. 30, 1913.

RED CEDAR RIVER AT MENOMINEE, WIS.

Location.—About 900 feet below the power house of the Wisconsin & Minnesota Light & Power Co., about 13 miles above confluence of Red Cedar and Chippewa rivers. Wilson Creek discharges from the right into service reservoir just above station.

Records available.—June 16, 1907, to September 5, 1908; May 9 to September 30, 1913.

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Drainage area.—1,810 square miles.

Gage.—Barrett & Lawrence recording gage installed May 9, 1913, over wooden intake and well on the right bank of the river about 1 mile above highway bridge located about 200 rods west of the Chicago & Northwestern Railway station west of Menominee. Gage used from June 16, 1907, to September 5, 1908, was attached to this bridge. No determined relation between datums of the gages.

Channel and control.—Heavy gravel and rock; practically permanent.

Discharge measurements.—Made from highway bridge to which old gage was fastened.

Winter flow.—Discharge relation not affected by ice, as the relatively high temperature of the water coming from the service reservoir immediately above the gage prevents ice from forming on the control section below.

Regulation.—Flow controlled by dams at Menominee and at Cedar Falls, also by natural storage in the headwaters. Operation of the power plants of the Chippewa Valley Railway, Light & Power Co., at Menominee and Cedar Falls and of smaller plants on the tributaries to Red Cedar River above Menominee causes considerable diurnal fluctuation in stage.

Accuracy.—Records excellent, as rating curve has been carefully developed and the recording gage enables the mean stage to be accurately determined.

Cooperation.—Recording gage installed and gage heights furnished by Wisconsin & Minnesota Light & Power Co. Discharge measurements and computations made by United States Geological Survey in cooperation with Railroad Commission of Wisconsin.

Discharge measurements of Red Cedar River at Menominee, Wis., during the year ending Sept. 30, 1913.

Date.	Made by—	a Gage height.	Discharge.	Date.	Made by—	a Gage height.	Discharge
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 18	W. G. Hoyt	2.22	667	Mar. 20	S. B. Soulé	3.80	3,070
18	do	2.52	1,060	May 7	do	2.78	1,410
20	S. B. Soulé	3.42	2,350				

a Hook gage located at the recording gage.

Daily gage height, in feet, of Red Cedar River at Menominee, Wis., for the year ending Sept. 30, 1913.

[B. & L. recording gage.]

Day.	May.	June.	July.	Aug.	Sept.	Day.	May.	June.	July.	Aug.	Sept.
1	.....	2.88	2.51	2.56	2.25	16	2.80	2.60	2.90	2.50	2.51
2	.....	2.83	2.44	2.49	2.45	17	2.74	2.64	2.92	2.43	2.46
3	.....	2.77	2.34	2.23	2.48	18	3.15	2.52	2.88	2.30	2.37
4	.....	2.52	2.26	2.35	2.43	19	3.34	2.41	2.83	2.35	2.44
5	.....	2.44	2.73	2.33	2.49	20	3.46	2.40	2.54	2.36	2.42
6	.....	2.53	3.92	2.36	2.54	21	3.29	2.43	2.69	2.49	2.28
7	.....	2.52	3.90	2.37	2.30	22	3.82	2.12	2.57	2.49	2.49
8	.....	2.45	3.77	2.42	2.46	23	3.36	2.34	2.53	2.54	2.48
9	2.12	2.67	3.48	2.47	2.46	24	3.36	2.50	2.57	2.29	2.45
10	2.52	2.53	3.05	2.20	2.47	25	3.20	2.50	2.61	2.55	2.41
11	2.45	2.41	2.91	2.42	2.39	26	3.19	2.44	2.56	2.58	2.56
12	2.49	2.36	2.88	2.42	2.30	27	3.09	2.38	2.27	2.56	2.52
13	2.62	2.40	2.48	2.31	2.56	28	3.02	2.54	2.48	2.53	2.12
14	2.56	2.39	2.85	2.42	2.27	29	2.87	2.49	2.58	2.47	2.46
15	2.60	2.10	2.93	2.52	2.44	30	3.07	2.46	2.51	2.44	2.42
						31	3.21	.....	2.73	2.13	.....

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Daily discharge, in second-feet, of Red Cedar River at Menominee, Wis., for the year ending Sept. 30, 1913.

Day.	May.	June.	July.	Aug.	Sept.	Day.	May.	June.	July.	Aug.	Sept.
1	.....	1,550	1,030	1,100	710	16	1,430	1,150	1,580	1,020	1,030
2	.....	1,480	942	1,010	955	17	1,350	1,210	1,610	929	988
3	.....	1,390	818	686	994	18	1,960	1,050	1,550	772	854
4	.....	1,050	720	830	929	19	2,250	903	1,480	830	942
5	.....	940	1,330	806	1,010	20	2,450	890	1,070	842	916
6	.....	1,060	3,330	842	1,070	21	2,170	929	1,280	1,010	746
7	.....	1,050	3,260	854	770	22	3,110	554	1,110	1,010	1,010
8	.....	955	3,010	916	968	23	2,290	818	1,060	1,070	994
9	554	1,250	2,490	981	968	24	2,290	1,020	1,110	758	963
10	1,050	1,060	1,800	650	981	25	2,030	1,020	1,160	1,080	903
11	955	903	1,000	916	878	26	2,020	942	1,100	1,120	1,120
12	1,010	842	1,550	916	770	27	1,860	866	734	1,100	1,090
13	1,180	890	980	782	1,120	28	1,760	1,070	994	1,060	554
14	1,120	878	1,500	916	734	29	1,540	1,010	1,120	991	968
15	1,150	530	1,620	1,050	942	30	1,840	968	1,030	942	916
						31	2,050	.....	1,330	566	.....

NOTE.—Daily discharge computed from a rating curve well defined between 530 and 7,730 second-feet (gage heights 2.1 to 5.7 feet).

Monthly discharge of Red Cedar River at Menomonie, Wis., for the year ending Sept. 30, 1913.

[Drainage area, 1,810 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
May 9–31	3,110	554	1,710	0.945	0.81	A.
June	1,550	530	1,010	.558	.62	A.
July	3,300	720	1,460	.807	.93	A.
August	1,120	566	915	.506	.58	A.
September	1,120	554	925	.511	.57	A.

ZUMBRO RIVER AT ZUMBRO FALLS, MINN.

Location.—At the highway bridge at Zumbro Falls, about 8 miles below mouth of South Branch.

Records available.—June 8, 1909, to September 30, 1913.

Drainage area.—1,120 square miles.

Gage.—Chain gage attached to bridge; read twice daily to hundredths. Limits of use: Hundredths below 5.0, half-tenths from 5.0 to 6.5, and tenths above 6.5 feet.

Channel and control.—Slightly shifting.

Discharge measurements.—Made from bridge.

Winter flow.—For a short time during and following an extremely cold period, ice forming below the gage causes backwater. The river is fed, however, by springs in the vicinity of the gage and the warmer water gradually wears away the ice. Gage is read daily during the winter and close inspection of gage heights and temperature records furnish basis for necessary corrections to estimates of daily discharge.

Maximum flow.—The high water of June, 1908, is marked by a spike in a telegraph pole near the railroad station at Zumbro Falls. This spike is 26.7 feet above the datum of the gage. The high water of April, 1888, reached a stage of approximately 29.7, as shown by a mark not so well defined as that of the flood of 1908.

Regulation.—The effect of slight artificial regulation at the small power plants above Zumbro Falls is not observable at the gage.

Discharge measurements of Zumbro River at Zumbro Falls, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Feb. 7	S. B. Soulé	4.86	[a] 124	June 26	Hoyt & Peterson	10.10	[b] 2,930
Apr. 1	W. G. Hoyt	6.12	586	Sept. 26	S. B. Soulé	5.01	199
1	....do	6.12	576	26	....do	5.01	195

[a] About one-fourth ice cover at gage; very little ice at control. [b] Measurement made by surface method.

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Daily gage height, in feet, of Zumbro River at Zumbro Falls, Minn., for the year ending Sept. 30, 1913.

[A. H. Sugg, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	4.98	5.0	5.1	4.90	5.0	4.90	6.2	5.2	5.3	5.75	5.25	4.88
2	4.98	4.99	5.1	4.90	4.90	.....	6.9	5.2	5.3	5.6	5.15	4.90
3	4.96	5.0	5.0	4.85	4.90	4.89	7.5	5.25	5.2	5.5	5.1	4.92
4	4.90	4.99	5.05	4.85	4.90	4.86	6.9	5.3	5.2	5.75	5.05	4.91
5	4.94	4.99	5.1	4.80	4.90	4.89	6.4	5.35	5.2	6.9	5.0	4.86
6	4.92	4.95	5.15	4.80	4.90	4.90	6.05	5.35	5.15	6.6	4.99	4.80
7	4.89	4.99	4.95	4.85	4.90	4.89	5.85	5.3	5.15	6.15	5.0	4.80
8	4.95	4.96	.....	4.90	4.90	4.92	5.75	5.25	5.1	5.8	4.98	4.80
9	4.89	4.99	.....	4.90	4.90	7.8	5.7	5.2	5.0	5.6	5.0	4.85
10	4.94	4.98	6.05	4.85	4.90	11.2	5.7	5.2	5.0	5.5	5.05	4.85
11	4.96	4.98	5.9	4.85	5.0	11.0	5.75	5.15	4.96	5.5	5.4	4.92
12	5.05	5.0	.....	4.85	5.0	9.5	6.2	5.15	4.98	5.55	5.35	4.84
13	5.2	5.15	5.4	4.85	4.80	8.2	6.5	5.2	5.0	5.6	5.3	4.85
14	5.2	5.35	5.2	4.85	4.80	10.6	6.3	5.2	4.96	5.65	5.2	4.85
15	5.2	5.4	5.05	4.85	4.90	8.7	6.0	5.5	4.88	5.8	5.1	4.79
16	5.15	5.25	5.0	4.85	4.90	7.5	5.8	5.9	4.81	5.5	5.05	4.78
17	5.1	5.2	5.0	4.90	4.90	6.4	5.7	6.3	4.82	5.4	5.0	4.80
18	5.1	5.15	4.99	4.90	5.1	6.2	5.6	6.6	4.81	5.35	4.98	4.81
19	5.1	5.2	5.0	4.90	5.45	6.9	5.55	6.45	4.80	5.3	5.0	5.0
20	5.05	5.1	4.96	4.95	5.2	6.8	5.45	6.25	5.0	5.2	5.0	5.0
21	5.05	5.1	4.75	4.90	5.1	6.2	5.45	6.5	4.96	5.2	5.4	4.90
22	5.05	5.1	4.75	4.90	4.80	5.7	5.5	6.6	4.95	5.2	5.05	4.84
23	5.05	5.1	4.86	4.90	4.85	5.9	5.4	6.4	4.94	5.1	5.0	4.86
24	5.0	5.05	4.95	4.90	4.90	12.4	5.4	6.1	5.1	5.15	5.0	4.94
25	5.0	5.0	5.0	4.90	5.0	10.4	5.4	5.9	9.7	5.1	4.99	5.0
26	5.0	5.0	4.96	4.90	5.0	8.0	5.4	5.8	9.7	5.1	4.98	4.98
27	5.05	5.0	4.92	4.90	4.95	6.8	5.3	5.7	7.9	5.0	4.99	4.98
28	5.0	5.05	4.91	4.90	4.90	6.5	5.35	5.7	7.0	5.0	4.96	4.94
29	5.0	5.0	4.95	4.90	.....	6.6	5.3	5.6	6.3	5.6	4.90	4.94
30	5.0	4.98	4.85	4.95	.....	6.5	5.25	5.5	5.85	5.7	4.95	4.92
31	5.0	.....	4.99	5.1	.....	6.3	.....	5.4	.....	5.5	4.90	.....

NOTE.—Discharge relation probably affected by ice about Dec. 4–15, Jan. 7 to Feb. 14, and Feb. 23 to Mar. 8.

Daily discharge, in second-feet, of Zumbro River at Zumbro Falls, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	186	190	210	164	.....	.....	612	246	276	433	261	169
2	186	188	210	164	.....	.....	930	246	276	378	232	172
3	183	190	190	156	.....	.....	1,240	261	246	342	218	176
4	172	188	.....	156	.....	.....	930	276	246	433	206	174
5	179	188	.....	150	.....	.....	698	292	246	612	193	166
6	176	181	.....	150	.....	.....	550	292	232	788	191	156
7	170	188	.....	.....	.....	.....	471	276	232	591	193	156
8	181	183	.....	.....	.....	.....	433	261	218	452	189	156
9	170	188	.....	.....	.....	1,400	414	246	193	378	193	164
10	179	186	.....	.....	.....	3,770	414	246	193	342	206	164
11	183	186	.....	.....	.....	3,610	433	232	185	342	308	176
12	200	190	.....	.....	.....	2,480	612	232	189	360	292	162
13	232	221	.....	.....	.....	1,640	742	246	193	378	276	164
14	232	269	.....	.....	.....	3,300	654	246	185	396	246	164
15	232	282	.....	.....	164	1,940	530	342	169	452	218	155
16	221	244	190	.....	164	1,240	452	490	158	342	206	154
17	210	232	190	.....	164	698	414	654	159	308	193	156
18	210	221	188	.....	206	612	378	788	158	292	189	158
19	210	232	190	.....	308	930	360	720	156	276	193	193
20	200	210	183	.....	232	882	325	633	193	246	193	193
21	200	210	149	.....	206	612	325	742	185	246	308	172
22	200	210	149	.....	150	414	342	788	182	246	206	162
23	200	210	166	.....	.....	490	308	698	180	218	193	166
24	190	200	181	.....	.....	4,730	308	570	218	232	193	180
25	190	190	190	.....	.....	3,140	308	490	2,620	218	191	193
26	190	190	183	.....	.....	1,520	308	452	2,620	218	189	189
27	200	190	176	.....	.....	882	276	414	1,460	193	191	189
28	190	200	174	.....	.....	742	292	414	980	193	185	180
29	190	190	181	.....	.....	788	276	378	654	378	172	180
30	190	186	164	.....	.....	742	261	342	471	414	182	176
31	190	.....	188	.....	.....	654	.....	308	.....	342	172	.....

NOTE.—Daily discharge Oct. 1 to Dec. 31 computed from a fairly well defined rating curve. Daily discharge Mar. 9 to Sept. 30 computed from a rating curve well defined between 156 and 3,610 second-feet (gage heights 4.8 and 11.0 feet). Discharge estimated, because of ice, from gage heights, observer's notes, discharge measurements, and climatic records as follows: Dec. 4–15, 185 second-feet; Jan. 7–31, 140 second-feet; Feb. 1–14, 127 second-feet; Feb. 23–28, 136 second-feet; and Mar. 1–8, 160 second-feet.

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Monthly discharge of Zumbro River at Zumbro Falls, Minn., for the years ending Sept. 30, 1912–13.

[Drainage area, 1,120 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1912.						
October	8,340	147	1,500	1.34	1.54	B.
November	520	200	350	.312	.35	A.
December	3,840	202	573	.512	.59	B.
January	.....	.....	245	.219	.25	C.
February	269	232	242	.216	.23	B.
March	5,200	221	993	.887	1.02	A.
April	2,320	566	1,200	1.07	1.19	A.
May	5,860	325	846	.755	.87	A.
June	442	210	294	.262	.29	A.
July	462	200	303	.271	.31	A.
August	442	190	241	.215	.25	A.
September	232	176	198	.177	.20	A.
The year	8,340	.....	585	.522	7.09	
1913.						
October	232	170	195	.174	.20	A.
November	282	181	204	.182	.20	A.
December	.....	.....	183	.163	.19	B.
January	.....	.....	143	.128	.15	C.
February	308	.....	149	.133	.14	C.
March	4,730	.....	1,240	1.11	1.28	B.
April	1,240	261	487	.435	.49	A.
May	788	232	414	.370	.43	A.
June	2,620	156	456	.407	.45	B.
July	788	193	356	.318	.37	A.
August	308	172	212	.189	.22	A.
September	192	154	170	.152	.17	A.
The year	4,730	.....	353	.315	4.29	

NOTE.—Estimates of "Discharge in second-feet per square mile" and "Run-off (depth in inches)" for 1912 supersede those published in Water-Supply Paper 325, which were computed from an erroneous value of the drainage area. Estimates for October, November, and December, 1911, are republished to complete the data for the climatic year.

SOUTH BRANCH OF ZUMBRO RIVER NEAR ZUMBRO FALLS, MINN.

Location.—In sec. 22, T. 109 N., R. 14 W., at the Woodville Bridge, 1¼ miles above mouth of river, 6 miles below mouth of Middle Branch.

Records available.—June 16, 1911, to September 30, 1913.

Drainage area.—821 square miles.

Gage.—Chain gage attached to bridge; read morning and evening to quarter-tenths Limits of use: Hundredths below 2.5, half-tenths from 2.5 to 3.5, and tenths above 3.5 feet.

Channel and control.—Well-defined riffle a short distance below gage; channel practically permanent.

Discharge measurements.—Made from highway bridge.

Winter flow.—River freezes over in vicinity of gage, but rapids below remain partly open, so that backwater effect is small. Discharge measurements are made to aid in making estimates for the winter period.

Regulation.—Flow at gage not noticeably affected by operation of small power plants above.

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Discharge measurements of South Branch of Zumbro River near Zumbro Falls, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Feb. 6	S. B. Soulé	2.14	[a] 82	June 25	B. J. Peterson	7.18	[b] 3,500
Apr. 2	W. G. Hoyt	2.67	363	Sept. 25	S. B. Soulé	2.00	136

[a] Almost completely frozen over at control.
[b] Velocity determined by surface method.

Daily gage height, in feet, of South Branch of Zumbro River near Zumbro Falls, Minn., for the year ending Sept. 30, 1913.

[W. M. Whipple, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.96	1.99	2.01	1.94	.....	.....	2.75	2.18	2.25	2.55	2.18	1.92
2	1.96	1.99	2.06	1.89	.....	.....	2.7	2.19	2.16	2.38	2.11	1.99
3	1.99	1.99	2.09	1.84	.....	.....	2.95	2.18	2.14	2.31	2.06	1.96
4	1.94	1.99	2.04	1.86	.....	.....	3.05	2.18	2.11	2.42	2.04	1.98
5	1.94	1.96	2.01	1.89	.....	.....	2.85	2.21	2.13	2.6	2.06	1.94
6	1.99	1.94	2.04	1.86	2.15	2.12	2.65	2.18	2.09	3.2	2.01	1.98
7	2.01	1.96	2.04	1.84	.....	.....	2.48	2.18	2.06	2.8	2.01	1.96
8	1.96	1.94	1.99	1.85	.....	3.7	2.34	2.18	2.00	2.55	2.08	1.94
9	1.99	1.96	2.01	.....	.....	7.2	2.13	2.16	1.98	2.38	2.06	1.99
10	1.99	1.94	2.01	.....	.....	6.5	2.10	2.12	1.99	2.28	2.20	1.96
11	1.96	1.94	2.02	.....	.....	6.6	2.48	2.13	1.98	2.25	2.35	1.99
12	2.06	1.99	1.94	.....	.....	5.4	2.7	2.09	2.00	2.32	2.24	1.96
13	2.19	2.08	1.91	.....	2.2	4.7	2.9	2.08	2.03	2.36	2.19	1.99
14	2.14	2.19	1.96	.....	.....	5.6	2.8	2.06	2.03	2.5	2.14	1.94
15	2.09	2.14	1.99	.....	.....	4.8	2.55	2.41	1.98	2.55	2.10	1.91
16	2.08	2.14	1.96	2.25	.....	3.3	2.45	2.65	1.93	2.31	2.06	1.91
17	2.09	2.09	1.99	.....	.....	2.9	2.38	2.9	1.95	2.26	2.05	1.91
18	2.06	2.04	1.96	.....	.....	2.85	2.33	3.05	1.95	2.19	2.02	1.91
19	2.01	2.05	1.99	.....	.....	3.15	2.28	2.8	1.95	2.14	2.02	1.98
20	2.01	2.06	1.95	.....	.....	3.1	2.23	2.7	1.97	2.10	2.01	2.01
21	2.04	2.01	1.82	.....	2.28	2.65	2.19	2.95	2.04	2.11	2.24	1.96
22	2.01	2.01	1.91	.....	.....	2.49	2.19	3.05	1.98	2.09	2.04	1.94
23	2.01	2.04	1.94	2.1	.....	2.38	2.23	2.85	1.95	2.06	2.01	1.99
24	2.01	2.01	1.92	.....	.....	8.2	2.19	2.65	2.43	2.05	2.00	2.04
25	1.98	1.99	1.96	.....	.....	6.2	2.19	2.55	6.1	2.05	1.99	2.04
26	1.99	1.99	1.91	.....	.....	4.2	2.19	2.45	5.8	2.06	1.99	2.01
27	2.00	1.99	1.94	.....	2.15	3.3	2.19	2.41	4.2	2.06	2.01	2.01
28	1.99	2.01	1.89	.....	.....	3.1	2.19	2.36	3.4	2.02	1.95	2.01
29	2.01	1.96	1.84	.....	.....	3.0	2.22	2.31	2.85	2.85	1.96	1.96
30	1.99	2.00	1.86	2.12	.....	2.95	2.22	2.27	2.65	2.44	1.95	1.99
31	1.96	.....	1.91	.....	.....	2.8	.....	2.27	.....	2.35	1.91	.....

NOTE.—Discharge relation probably affected by ice about Jan. 9 to Mar. 9.

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Daily discharge, in second-feet, of South Branch of Zumbro River near Zumbro Falls Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	103	112	118	96	.....	.....	399	176	202	317	176	99
2	103	112	135	82	.....	.....	378	180	169	250	152	112
3	112	112	145	71	.....	.....	484	176	162	224	135	103
4	96	112	128	75	.....	.....	528	176	152	266	128	109
5	96	103	118	82	.....	.....	441	187	158	337	135	96
6	112	96	128	75	.....	.....	358	176	145	595	118	109
7	118	103	128	71	.....	.....	289	176	135	420	118	103
8	103	96	112	73	.....	.....	235	176	115	317	141	96
9	112	103	118	.....	.....	.....	158	169	109	250	135	112
10	112	96	118	.....	.....	2,940	148	155	112	213	183	103
11	103	96	122	.....	.....	3,030	289	158	109	202	239	112
12	135	112	96	.....	.....	1,960	378	145	115	228	198	103
13	180	141	87	.....	.....	1,440	462	141	125	243	180	112
14	162	180	103	.....	.....	2,130	420	135	125	207	162	96
15	145	162	112	.....	.....	1,510	317	262	109	317	148	87
16	141	162	103	.....	.....	640	278	358	93	224	135	87
17	145	145	112	.....	.....	462	250	462	100	205	132	87
18	135	128	103	.....	.....	441	231	528	100	180	122	87
19	118	132	112	.....	.....	572	213	420	100	162	122	109
20	118	135	100	.....	.....	550	194	378	106	148	118	118
21	128	118	66	.....	.....	358	180	484	128	152	198	103
22	118	118	87	.....	.....	293	180	528	109	145	128	96
23	118	128	96	.....	.....	250	194	441	100	135	118	112
24	118	118	90	.....	.....	4,590	180	358	270	132	115	126
25	109	112	103	.....	.....	2,670	180	317	2,580	132	112	126
26	112	112	87	.....	.....	1,130	180	278	2,310	135	112	118
27	115	112	96	.....	.....	640	180	262	1,130	135	118	118
28	112	118	82	.....	.....	550	180	243	690	122	100	118
29	118	103	71	.....	.....	505	190	224	441	441	103	103
30	112	115	75	.....	.....	484	190	209	358	274	100	112
31	103	.....	87	.....	.....	420	.....	209	.....	239	87	.....

NOTE.—Discharge interpolated for days when gage was not read. Daily discharge computed from a rating curve well defined between 62 and 3,890 second-feet (gage heights 1.8 and 7.5 feet). Above discharge of 3,890 second-feet (gage height 7.5 feet) the rating curve is an extension and is subject to an error of about 10 per cent at a discharge of 6,490 second-feet (gage height 10 feet). Discharge estimated, because of ice, from gage heights, observer's notes, discharge measurements, climatic records, and discharge of adjacent drainage areas, as follows: Jan. 9–31, 80 second-feet; Feb. 1–28, 90 second-feet; and Mar. 1–9, 500 second-feet.

Monthly discharge of South Branch of Zumbro River near Zumbro Falls, Minn., for the year ending Sept. 30, 1913.

[Drainage area, 821 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	180	96	120	0.146	0.17	B.
November	180	96	120	.146	.16	B.
December	145	66	104	.127	.15	C.
January	.....	.....	79.5	.097	.11	C.
February	.....	.....	90	.110	.11	C.
March	4,590	.....	1,030	1.25	1.44	C.
April	528	148	276	.336	.37	A.
May	528	135	267	.325	.37	A.
June	2,580	93	355	.432	.48	B.
July	595	122	240	.292	.34	A.
August	239	87	138	.168	.19	B.
September	128	87	106	.129	.14	C.
The year	4,590	.....	246	.300	4.03	

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ROOT RIVER NEAR HOUSTON, MINN.

Location.—In sec. 34, T. 104 N., R. 6 W., at highway bridge 1 mile east of Houston and 1 mile above mouth of South Root River, which is ordinarily a relatively insignificant stream, but during heavy rains floods considerable area.

Records available.—May 28, 1909, to September 30, 1913.

Drainage area.—1,560 square miles.

Gage.—Vertical staff, read morning and evening to quarter-tenths. Limits of use: Half-tenths below and tenths above 1.5 feet.

Channel and control.—No well-defined control; channel is shifting, scouring out during floods and gradually filling in afterwards; nearly permanent at low stages.

Discharge measurements.—Made from bridge.

Winter flow.—Gage readings discontinued during ice period of 1913; flow estimated from that of North Branch Root near Lanesboro, there being a well-defined open-water relation between these stations.

Regulation.—No dam below station; nearest dam above is at Rushford. As the flow is ample at all times for the power generated at that point it is not held back during certain parts of the day, and thus the dam has no influence on the gage heights at Houston.

Accuracy.—Estimates of discharge for flood stages above 8.9 feet in 1911, as published in Water-Supply Paper 305, are too low on account of an erroneous extension of the rating curve above 8.9 feet. The high-water section of the rating curve, based on discharge measurements made June 28 and 29, 1914, at gage heights 9.80 and 6.98 feet gives the same discharge as the rating curve used for 1911 at about gage height 8.9 feet. At gage height 10.0 feet the new curve gives a discharge about 44 per cent larger than that given by the rating curve for 1911. Maximum gage height, 10.8 feet, occurred on August 14, 1911, discharge about 15,200 second-feet. Because of shifting channel the results can not be considered better than fair.

Discharge measurements of Root River near Houston, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 31	S. B. Soulé	3.28	1,060	Sept. 24	B. J. Peterson	1.20	296
June 28	do	1.88	552				

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Daily gage height, in feet, of Root River near Houston, Minn., for the year ending Sept. 30, 1913.

[Olaf Larson, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1.4	1.4	1.4				3.0	1.4	1.7	1.4	1.8	1.2
2	1.4	1.4	1.7				2.8	1.4	1.6	1.3	1.7	1.3
3	1.3	1.4	1.5				3.0	1.4	1.5	1.3	1.6	1.3
4	1.3	1.4	1.5				3.2	1.6	1.5	4.1	1.5	1.3
5	1.3	1.4	1.5				2.9	1.5	1.4	3.7	1.4	1.3
6	1.3	1.4	1.6				2.6	1.5	1.4	2.4	1.4	1.2
7	1.3	1.4	1.3				2.5	1.4	1.4	1.9	1.3	1.2
8	1.3	1.4	1.4				2.4	1.4	1.4	1.7	1.3	1.2
9	1.3	1.4	2.8				2.2	1.4	1.4	1.5	1.5	1.2
10	1.3	1.3					2.3	1.4	1.3	1.4	2.6	1.2
11	1.3	1.4					2.3	1.4	1.3	1.6	2.1	1.2
12	1.8	1.4					2.5	1.4	1.3	2.1	2.0	1.2
13	1.9	1.6					2.7	1.3	1.2	2.0	1.7	1.2
14	1.8	1.5					2.5	1.5	1.2	3.4	1.6	1.3
15	1.7	1.6					2.4	1.7	1.3	2.9	1.5	1.2
16	1.6	1.6					2.2	1.7	1.2	2.0	1.5	1.2
17	1.5	1.5					2.1	2.0	1.2	1.7	1.5	1.2
18	1.5	1.4					2.0	2.3	1.2	1.6	1.4	1.2
19	1.4	1.4					1.9	2.2	1.2	1.6	1.4	1.2
20	1.5	1.4					1.8	2.4	1.7	1.5	1.4	1.6
21	1.5	1.4					1.8	2.7	1.6	1.4	1.6	1.3
22	1.5	1.5				3.6	1.8	2.6	1.4	1.4	1.4	1.2
23	1.4	1.4				3.1	1.7	2.5	1.3	1.4	1.3	1.2
24	1.4	1.4				8.8	1.7	2.4	1.3	1.4	1.4	1.2
25	1.4	1.4				9.0	1.6	2.2	2.1	1.3	1.3	1.4
26	1.4	1.4				5.3	1.6	2.1	1.4	1.3	1.3	1.4
27	1.4	1.4				4.1	1.6	2.1	1.5	1.4	1.3	1.4
28	1.4	1.2				3.4	1.5	2.1	1.9	1.3	1.3	1.3
29	1.4	1.3				3.8	1.5	1.9	1.7	2.5	1.2	1.2
30	1.4	1.3				3.7	1.5	1.8	1.5	3.4	1.2	1.4
31	1.4					3.3		1.7		2.2	1.3	

NOTE.—Discharge relation affected by ice about Dec. 9, 1912, to Mar. 22, 1913.

Daily discharge, in second-feet, of Root River near Houston, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	405	405	405				930	405	482	405	507	301
2	405	405	482				851	405	456	380	471	325
3	380	405	430				930	405	430	380	440	325
4	380	405	430				1,010	456	430	1,440	410	322
5	380	405	430				890	430	405	1,230	379	327
6	380	405	456				776	430	405	703	379	296
7	380	405	380				739	405	405	537	350	296
8	380	405	405				703	405	405	482	350	296
9	380	405					632	405	405	430	404	294
10	380	380					667	405	380	405	791	294
11	380	405					667	405	380	456	595	292
12	509	405					739	405	380	598	557	292
13	537	456					813	380	356	566	459	290
14	509	430					739	430	356	1,100	428	313
15	482	456					703	482	380	890	396	290
16	456	456					632	482	356	566	396	288
17	430	430					598	566	356	494	393	288
18	430	405					566	667	356	462	366	285
19	405	405					537	632	356	459	366	285
20	430	405					509	703	482	428	363	355
21	430	405					509	813	456	396	419	305
22	430	430					509	776	405	396	360	292
23	405	405				970	482	739	380	396	334	283
24	405	405				5,840	482	703	380	393	360	292
25	405	405				6,090	456	632	598	366	332	327
26	405	405				2,200	456	598	405	363	332	327
27	405	405				1,440	456	598	430	390	330	327
28	405	356				1,100	430	598	537	380	330	308
29	405	380				1,280	430	537	482	770	305	281
30	405	380				1,230	430	509	430	1,180	303	327
31	405					1,050		482		646	327	

NOTE.—Daily discharge Oct. 1, 1912, to July 16, 1913, computed from a well-defined rating curve. Daily discharge Sept. 24–30 computed from a rating curve well defined between 888 and 10,600 second-feet (gage heights 3.0 and 10.0 feet) and fairly well defined below 843 second-feet (gage height 2.9 feet). Indirect method used from July 17 to Sept. 23. Discharge estimated, because of ice, from climatic records and open-water relation between flow of North Branch of Root River near Lanesboro and of Root River near Houston, as follows: Dec. 9–31, 1912, 285 second-feet; Jan. 1–31, 240 second-feet; Feb. 1–28, 250 second-feet; Mar. 1–10, 1480 second-feet; and Mar. 11–22, 1,930 second-feet.

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Monthly discharge of Root River near Houston, Minn., for the year ending Sept. 30, 1913.

[Drainage area, 1,560 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	537	380	417	0.267	0.31	B.
November	456	356	408	.262	.29	B.
December	.....	.....	322	.206	.24	D.
January	.....	.....	240	.154	.18	D.
February	.....	.....	250	.160	.17	D.
March	6,090	.....	1,910	1.22	1.41	D.
April	1,010	430	642	.412	.46	B.
May	813	380	525	.337	.39	B.
June	598	356	415	.266	.30	B.
July	1,440	360	583	.374	.43	B.
August	791	303	404	.259	.30	C.
September	385	281	304	.195	.22	B.
The year	6,090	.....	538	.345	4.70	

NORTH BRANCH OF ROOT RIVER NEAR LANESBORO, MINN.

Location.—In sec. 6, T. 103 N., R. 9 W., in Fillmore County, at first highway bridge 1 mile above junction of North and South branches, 2 miles north of Lanesboro and about 5 miles below a small creek that enters from the west.

Records available.—March 9, 1910, to September 30, 1913.

Drainage area.—647 square miles.

Gage.—Chain gage; read morning and evening to quarter-tenths. Limit of uses: Hundredths below 2.5, half-tenths from 2.5 to 4.0, and tenths above 4.0 feet.

Channel and control.—Practically permanent. As there is more than 10 feet fall between the station and the mouth of the South Branch backwater from that stream is improbable. One thousand feet back from the right bank is an old channel through which the river formerly flowed. At a stage of 6 feet the flow commences through this old channel. At extreme flood stage the right bank is overflowed for a width of one-fourth mile.

Discharge measurements.—Made from the bridge. At extreme flood stages measurements can be made from the railroad bridge just above the junction with South Branch.

Winter flow.—Determined by measurements. Discharge relation affected by ice.

Accuracy.—Information obtained since the preparation of estimates of discharge for 1912 indicates that the rating curve used for the year ending September 30, 1913, should also have been used from May 26 to December 8, 1912. Estimates of discharge as computed from the revised rating curve are about 6 per cent larger at gage height 2 feet and about 5 per cent smaller at gage height 3 feet than those published in Water-Supply Paper 325 for period subsequent to May 26, 1912. Conditions at this station are favorable for accurate results; estimates should be reliable.

Discharge measurements of North Branch of Root River near Lanesboro, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 25	S. B. Soulé	2.41	a 93.7	June 27	S. B. Soulé	2.57	333
Mar. 4	do	2.59	a 85.7	Sept. 24	B. J. Peterson	1.86	93.8
Apr. 1	do	2.59	347				

a Complete ice cover.

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Daily gage height, in feet, of North Branch of Root River at Lanesboro, Minn., for the year ending Sept. 30, 1913.

[K. E. Holum, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.06	2.05	2.05	.....	.....	.....	2.55	2.08	2.18	2.18	2.24	1.72
2	2.08	2.05	2.10	2.0	.....	.....	2.49	2.08	2.18	2.12	2.19	1.80
3	2.08	2.05	2.08	.....	.....	.....	2.95	2.10	2.15	2.08	2.14	1.72
4	2.05	2.05	2.05	.....	.....	2.6	2.85	2.25	2.12	2.32	2.10	1.69
5	2.04	2.05	2.15	.....	.....	.....	2.5	2.22	2.12	2.75	2.04	1.70
6	2.05	2.02	2.20	.....	2.5	1.6	2.45	2.25	2.12	2.31	2.04	1.72
7	2.05	2.02	2.16	.....	.....	.....	2.38	2.25	2.20	2.18	2.01	1.78
8	2.05	2.00	2.12	.....	.....	.....	2.35	2.18	2.10	2.08	2.28	1.70
9	2.02	2.02	2.08	2.2	.....	5.3	2.25	2.12	2.12	2.05	2.15	1.71
10	2.02	2.02	2.05	.....	.....	5.4	2.20	2.12	2.12	2.08	2.41	1.88
11	2.05	2.02	2.06	.....	.....	4.1	2.40	2.12	2.11	2.18	2.25	1.80
12	2.18	2.09	2.06	.....	.....	4.3	2.7	2.16	2.11	2.6	2.15	1.78
13	2.5	2.18	2.05	.....	2.5	4.5	2.95	2.18	2.02	2.30	2.12	1.70
14	2.30	2.14	2.05	.....	.....	9.9	2.55	2.22	2.02	[a]3.3	2.10	1.72
15	2.20	2.15	2.05	.....	.....	5.8	2.45	2.28	2.00	2.30	2.05	1.80
16	2.16	2.15	2.06	2.4	.....	3.45	2.38	2.45	2.01	2.22	2.05	1.80
17	2.12	2.15	2.02	.....	.....	2.9	2.32	2.7	2.00	2.12	2.10	1.80
18	2.12	2.19	1.98	.....	.....	2.9	2.29	2.8	2.01	2.08	2.08	1.78
19	2.15	2.22	1.98	.....	.....	5.6	2.22	2.6	2.02	2.02	2.08	1.85
20	2.15	2.35	.....	.....	2.9	3.8	2.22	2.6	2.22	2.02	2.02	1.85
21	2.19	2.28	.....	.....	.....	2.95	2.22	3.0	2.22	2.02	2.02	1.82
22	2.21	2.22	.....	.....	.....	2.5	2.19	2.8	2.19	1.98	2.06	1.82
23	2.10	2.15	.....	2.5	.....	2.5	2.19	2.75	2.15	2.02	2.05	1.81
24	2.05	2.12	.....	.....	.....	7.0	2.12	2.65	2.20	2.08	2.08	1.80
25	2.05	2.11	.....	2.4	.....	5.0	2.15	2.5	2.25	2.00	2.02	1.94
26	2.05	2.11	1.9	.....	.....	3.4	2.16	2.48	2.31	1.98	2.02	2.00
27	2.05	2.09	.....	.....	2.6	2.85	2.12	2.45	2.45	1.98	2.02	1.98
28	2.05	2.05	.....	.....	.....	2.7	2.08	2.38	2.38	2.05	1.96	1.90
29	2.05	2.05	.....	.....	.....	3.1	2.08	2.28	2.25	2.8	1.92	1.85
30	2.05	2.00	.....	2.3	.....	2.8	2.04	2.22	2.18	2.5	1.92	2.15
31	2.05	.....	.....	.....	.....	2.8	.....	2.00	.....	2.30	1.92	.....

[a] Gage height probably correct; rain on July 13.

NOTE.—Discharge relation affected by ice about Dec. 9, 1912, to Mar. 10, 1913.

Daily discharge, in second-feet, of North Branch of Root River near Lanesboro, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	150	147	147	.....	.....	.....	326	156	188	188	208	62
2	156	147	162	.....	.....	.....	301	156	188	168	191	79
3	156	147	156	.....	.....	.....	514	162	178	156	175	62
4	147	147	147	.....	.....	.....	463	212	168	236	162	56
5	144	147	178	.....	.....	.....	305	201	168	414	144	58
6	147	138	194	.....	.....	.....	286	212	168	233	144	62
7	147	138	181	.....	.....	.....	259	212	194	188	135	75
8	147	132	168	.....	.....	.....	248	188	162	156	222	55
9	138	138	.....	.....	.....	2,590	212	168	168	147	178	60
10	138	138	.....	.....	.....	2,700	194	168	168	156	270	99
11	147	138	.....	.....	.....	1,340	266	168	165	188	212	79
12	188	159	.....	.....	.....	1,530	391	181	165	347	178	75
13	305	188	.....	.....	.....	1,720	514	188	138	229	168	58
14	229	175	.....	.....	.....	8,800	326	201	138	715	162	62
15	194	178	.....	.....	.....	3,160	286	222	132	229	147	79
16	181	178	.....	.....	.....	813	259	286	135	201	147	79
17	168	178	.....	.....	.....	488	236	391	132	168	162	79
18	168	191	.....	.....	.....	488	226	438	135	156	156	75
19	178	201	.....	.....	.....	2,940	201	347	138	138	156	92
20	178	248	.....	.....	.....	1,070	201	347	201	138	138	92
21	191	222	.....	.....	.....	514	201	541	201	138	138	84
22	198	201	.....	.....	.....	305	191	438	191	126	156	84
23	162	178	.....	.....	.....	305	191	414	178	138	147	82
24	147	168	.....	.....	.....	4,660	168	369	194	156	156	102
25	147	165	.....	.....	.....	2,260	178	305	212	132	138	115
26	147	165	.....	.....	.....	779	181	297	233	126	138	132
27	147	159	.....	.....	.....	463	168	286	296	126	138	126
28	147	147	.....	.....	.....	391	156	259	259	147	121	104
29	147	147	.....	.....	.....	506	156	222	212	438	110	92
30	147	132	.....	.....	.....	438	144	201	188	305	110	178
31	147	.....	.....	.....	.....	438	.....	132	.....	229	110	.....

NOTE.—Daily discharge from Oct. 1 to Dec. 8, 1912, differs from that published in Water-Supply Paper 325 on account of a revision of the rating curve. See "Accuracy" in station description. Daily discharge computed from a rating curve well defined between 79 and 4,660 second-feet (gage heights 1.8 and 7.0 feet). Discharge estimated because of ice from gage heights, observer's notes, discharge measurements, and climatic records, as follows: Dec. 9–31, 120 second-feet; Jan. 1–31, 100 second-feet; Feb. 1–28, 102 second-feet; and Mar. 1–8, 100 second-feet.

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Monthly discharge of North Branch of Root River near Lanesboro, Minn., for the years ending Sept. 30, 1912–13.

[Drainage area, 647 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
1912.						
October	4,320	167	994	1.54	1.78	A.
November	376	171	275	.425	.47	A.
December	3,160	175	459	.709	.82	B.
January	.....	.....	180	.278	.32	C.
February	.....	.....	150	.232	.25	C.
March	7,640	.....	820	1.27	1.46	C.
April	3,400	329	895	1.38	1.54	A.
May	5,090	196	595	.920	1.06	B.
June	514	162	231	.357	.40	B.
July	1,240	162	287	.444	.51	A.
August	248	132	171	.264	.30	A.
September	259	132	166	.257	.29	A.
The year	7,640	.....	437	.675	9.20	
1913.						
October	305	138	166	.257	.30	A.
November	248	132	165	.255	.28	A.
December	.....	.....	132	.204	.24	C.
January	.....	.....	100	.155	18	C.
February	.....	.....	102	.158	.16	C.
March	8,800	.....	1,280	1.98	2.28	C.
April	514	144	258	.399	.45	A.
May	541	132	260	.402	.46	A.
June	286	132	179	.277	.31	A.
July	715	126	213	.329	.38	A.
August	270	110	159	.246	.28	A.
September	178	56	84.7	.131	.15	B.
The year	8,800	.....	260	.396	5.47	

NOTE.—Estimates for 1912 supersede those published in Water-Supply Paper 325. See "Accuracy" in station description.

UPPER IOWA RIVER NEAR DECORAH, IOWA.

Location.—At highway bridge in village of Freeport, which is 3 miles below Decorah and about 4 miles above upper power plant of the Upper Iowa Power Co. Nearest tributary, Trout Creek, enters from right about 1 mile above station.

Records available.—August 28 to September 30, 1913.

Drainage area.—551 square miles.

Gage.—Chain gage attached to bridge; read morning and evening to quarter-tenths. Limits of use: Hundredths below 3.0, half-tenths from 3.0 to 4.5, and tenths above 4.5 feet.

Channel and control.—Sand and gravel; may shift during high water.

Discharge measurements.—Made from bridge.

Regulation.—Flow regulated to some extent by operation of a number of small grist mills above the station.

Cooperation.—Gage heights furnished by the Upper Iowa Power Co.

Data insufficient for estimates of discharge.

Discharge measurements of Upper Iowa River near Decorah, Iowa, during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Aug. 6	W. G. Hoyt	2.36	[a] 72.8
27	S. B. Soulé	2.34	[a] 68

[a] Made by wading.

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Daily gage height, in feet, of Upper Iowa River near Decorah, Iowa, for the year ending Sept. 30, 1913.

[Charles Savoy, observer.]

Day.	Aug.	Sept.	Day.	Aug.	Sept.	Day.	Aug.	Sept.
1		2.20	11		2.20	21		2.30
2		2.25	12		2.20	22		2.30
3		2.25	13		2.15	23		2.30
4		2.22	14		2.15	24		2.34
5		2.22	15		2.15	25		2.34
6	2.36	2.20	16		2.15	26		2.35
7		2.20	17		2.25	27	2.25	2.30
8		2.20	18		2.20	28	2.22	2.25
9		2.20	19		2.20	29	2.22	2.28
10		2.15	20		2.45	30	2.22	2.30
						31	2.20	

WISCONSIN RIVER NEAR RHINELANDER, WIS.

Location.—In sec. 27, T. 36 N., R. 8 E., at highway bridge just below Rhinelander Power Co.'s power station, 8 miles southwest of Rhinelander, Wis., and 8 miles below mouth of Pelican River.

Records available.—December 1, 1905, to September 30, 1913.

Drainage area.—1,110 square miles.

Gage.—Standard chain gage fastened to upstream side of bridge; read once daily to tenths. Checked by wye levels August 13, 1913, and found in error; gage heights from November 27 to December 31, 1910 (published in Water-Supply Paper 285), for 1911 (published in Water-Supply Paper 305), and from January 1 to September 18, 1912 (published in Water-Supply Paper 325), should be corrected by subtracting 0.13 foot; all gage heights from September 19 to 30, 1912 (published in Water-Supply Paper 325), should be corrected by adding 0.12 foot. Gage heights subsequent to September 30, 1912, should be used as published in the following tables.

Channel and control.—Probably permanent.

Discharge measurements.—Made from downstream side of bridge.

Winter flow.—Owing to the relatively high temperature of the water coming from the service reservoirs, little ice forms in the vicinity of the gage.

Regulation.—Flow is regulated by the reservoirs of the Rhinelander Power Co.'s plant near Rhinelander and the plant at Otter Rapids, and is also modified by storage reservoirs in the headwaters operated by the Upper Wisconsin Valley Improvement Co.

Accuracy.—Results impaired by fluctuations due to the operation of the power plants and at times by backwater caused by grass in the stream. Records only fair.

Discharge measurements of Wisconsin River near Rhinelander, Wis., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Aug. 13	B. J. Peterson	3.19	[a] 1,070
14	do	3.14	[a] 1,010

[a] Large quantity of grass in channel.

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Daily gage height, in feet, of Wisconsin River near Rhinelander, Wis., for the year ending Sept. 30, 1913.

[G. N. Kramer, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3.4	3.3	2.1	2.7	2.4	2.7	3.2	3.8	3.4	2.5	3.7	3.4
2	3.5	3.5	3.7	2.6	2.1	2.1	2.9	3.5	3.7	2.8	3.2	3.1
3	3.1	2.8	3.5	2.5	2.3	2.8	3.9	3.5	3.7	2.5	3.8	3.5
4	3.3	3.5	3.3	2.5	2.3	2.9	3.5	2.7	3.5	2.1	3.1	3.7
5	3.7	3.9	3.5	2.5	2.4	2.6	3.9	3.3	3.7	2.7	3.0	3.4
6	2.5	3.7	3.7	2.6	2.4	2.8	3.9	2.9	3.5	2.0	2.9	3.1
7	3.2	3.5	3.5	2.4	2.3	2.9	3.8	3.0	3.5	2.5	3.4	2.5
8	3.6	3.6	2.5	2.3	2.3	2.6	3.8	2.6	2.5	2.9	3.7	3.4
9	3.7	3.5	3.4	2.4	2.0	2.9	3.6	2.9	3.8	2.7	3.2	3.0
10	3.3	3.1	3.7	2.5	2.6	2.8	4.0	2.9	3.6	3.1	2.1	3.4
11	3.2	3.4	3.2	2.5	2.4	2.8	3.8	2.1	3.4	2.8	2.7	3.0
12	3.6	3.6	3.3	2.1	2.3	2.7	3.6	2.9	3.6	3.2	2.8	3.0
13	2.2	3.5	3.5	2.6	2.3	2.7	2.2	3.0	3.2	2.1	3.2	3.3
14	3.4	3.4	3.5	2.3	2.2	2.5	3.8	2.7	3.3	3.7	3.1	2.1
15	3.7	3.4	2.3	2.4	2.6	3.0	3.8	3.0	2.3	4.0	3.3	3.0
16	3.3	3.3	3.5	2.4	1.7	2.9	4.0	3.0	2.4	3.9	2.9	2.9
17	3.4	2.9	3.3	2.4	2.5	2.6	3.8	2.7	2.6	3.6	1.8	2.9
18	3.2	3.5	3.4	2.4	2.3	2.7	3.6	2.3	2.7	3.8	3.3	2.9
19	3.6	3.5	3.2	2.1	2.3	3.0	3.9	3.6	2.4	4.0	3.3	2.7
20	2.9	3.6	3.3	2.5	2.9	2.9	3.8	3.9	2.7	2.3	2.9	3.0
21	3.5	3.4	3.1	2.1	2.2	2.6	3.8	3.8	2.6	3.1	3.1	2.5
22	3.5	3.6	2.8	2.1	2.3	3.1	3.6	3.6	2.0	2.9	3.1	3.5
23	3.3	3.4	3.0	2.3	2.6	3.0	4.0	3.4	2.4	2.8	3.3	3.7
24	3.4	2.8	2.8	2.3	2.4	3.0	3.8	3.5	2.6	3.3	1.9	3.5
25	3.6	3.5	3.0	2.4	2.7	2.7	4.0	3.6	2.6	3.1	3.3	3.8
26	3.4	3.4	2.7	2.1	2.8	2.7	3.5	3.6	2.7	3.8	3.3	3.8
27	2.7	3.5	3.0	2.3	2.3	3.0	3.6	3.7	2.6	3.5	3.5	3.4
28	3.4	3.3	3.0	2.4	2.5	2.8	3.8	3.7	2.4	4.5	3.1	2.8
29	3.6	3.3	2.8	2.3	.....	3.3	3.8	3.6	2.1	4.5	3.0	3.6
30	3.3	3.2	2.7	2.4	.....	3.2	3.7	3.7	2.9	4.5	3.4	3.6
31	3.6	.....	2.8	2.4	.....	3.2	.....	3.8	.....	3.9	2.1	.....

NOTE.—Discharge relation probably not materially affected by ice during the year ending Sept. 30, 1913.

Daily discharge, in second-feet, of Wisconsin River near Rhinelander, Wis., for the years ending Sept. 30, 1910–1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1909–10.												
1	535	1,520	1,300	1,100	1,100	1,200	1,400	913	750	604	675	469
2	1,000	1,400	1,300	1,100	1,100	1,300	1,630	1,400	604	604	604	1,000
3	188	1,520	1,520	1,400	1,400	1,860	469	1,200	750	38	535	750
4	535	1,520	1,520	829	1,400	1,200	1,100	1,300	750	18	535	66
5	535	1,740	1,200	1,520	1,520	1,860	1,630	1,300	291	604	535	347
6	291	1,520	913	1,300	604	535	1,740	1,400	1,000	604	535	750
7	913	1,300	675	829	1,520	1,300	1,630	1,200	675	1,200	66	604
8	913	1,300	675	1,630	1,000	1,000	1,630	406	1,100	675	535	750
9	1,000	1,300	675	1,100	913	750	1,300	1,200	829	604	535	750
10	238	1,100	913	1,100	1,400	675	469	604	675	38	750	750
11	1,000	1,300	1,000	1,300	1,100	829	1,200	913	675	675	604	291
12	1,000	1,300	1,100	1,300	1,400	1,100	1,300	604	18	675	535	750
13	750	1,520	1,000	1,400	1,100	469	1,100	604	750	604	675	750
14	913	1,400	1,000	1,300	1,000	1,100	829	604	829	604	469	829
15	750	2,220	913	1,400	1,200	829	1,100	238	604	675	604	913
16	829	1,860	1,000	1,100	1,740	1,100	1,200	750	604	750	675	829
17	142	1,520	913	1,000	1,000	1,000	604	913	604	18	604	829
18	1,000	1,740	1,100	1,400	1,520	1,100	1,300	604	604	675	604	38
19	913	1,740	829	1,100	1,630	1,000	1,300	913	18	675	469	675
20	1,300	1,860	1,000	1,300	535	347	913	1,100	604	535	406	750
21	1,000	1,630	1,000	1,300	1,740	1,000	1,300	1,200	604	675	38	604
22	1,200	1,740	1,200	1,100	1,630	1,200	1,100	675	604	675	469	469
23	1,000	1,630	1,000	1,200	1,200	1,300	1,000	1,300	535	469	469	469
24	1,000	1,100	1,200	1,000	1,630	1,520	535	1,200	604	291	535	469
25	829	1,400	1,000	913	1,740	1,520	913	1,300	604	469	535	38
26	829	913	1,000	1,100	1,740	1,520	1,300	1,400	18	469	604	535
27	1,000	1,980	1,200	913	1,100	604	1,300	1,300	535	750	604	535
28	1,000	1,520	1,300	829	1,740	1,740	1,400	1,200	535	535	291	604
29	1,000	1,630	1,100	829	.....	1,520	1,630	535	535	675	469	604
30	913	1,400	1,000	1,100	.....	1,200	1,520	1,200	604	535	469	604
31	291	.....	1,200	1,100	.....	1,300	.....	1,100	.....	291	469	.....

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Daily discharge, in second-feet, of Wisconsin River near Rhinelander, Wis., for the years ending Sept. 30, 1910–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1910-11.												
1	604	675	469	535	829	675	1,400	675	1,100	535	1,630	1,520
2	291	750	406	829	604	675	1,200	604	1,300	347	2,100	1,300
3	535	604	188	750	535	604	1,300	1,000	1,100	406	1,980	535
4	469	604	188	675	469	604	1,000	675	347	291	1,980	675
5	469	535	291	675	406	238	1,000	750	913	913	1,980	1,860
6	1,100	291	535	829	406	675	1,000	675	913	1,300	675	1,980
7	604	675	750	675	347	675	1,000	188	1,000	1,520	1,980	1,630
8	675	675	604	347	1,300	829	1,000	469	1,100	1,300	1,980	1,520
9	238	604	469	750	1,300	750	347	535	913	238	1,860	1,630
10	604	675	535	750	750	1,740	1,300	469	1,000	1,200	2,100	469
11	604	675	535	604	913	1,100	1,200	675	291	1,300	1,980	1,520
12	604	675	469	829	406	347	1,200	604	750	1,200	1,860	1,740
13	535	347	535	750	535	750	1,300	604	675	1,100	347	1,740
14	406	604	535	750	675	829	1,200	469	604	1,100	2,100	1,860
15	406	675	535	535	750	1,100	1,200	1,000	604	1,000	1,630	1,520
16	238	675	750	750	750	750	347	829	675	291	1,630	1,630
17	535	675	675	829	829	750	1,200	829	535	1,400	1,980	406
18	535	604	535	675	913	1,000	1,200	750	291	1,520	1,740	1,740
19	535	604	469	829	469	291	1,630	1,100	675	913	1,740	1,630
20	604	238	604	1,100	750	1,000	1,200	1,740	604	1,400	469	1,630
21	604	535	535	1,300	1,000	1,100	1,300	604	675	1,100	2,220	1,630
22	604	535	469	406	913	1,000	1,630	1,980	604	1,200	2,100	1,520
23	291	535	535	913	1,000	1,100	750	1,860	535	291	2,100	1,520
24	535	604	347	829	1,300	1,200	1,200	1,740	675	2,820	1,860	469
25	535	604	291	1,300	1,300	1,200	1,200	2,220	291	1,860	2,220	1,400
26	535	535	535	1,100	913	347	1,100	2,220	675	1,630	2,220	1,520
27	913	291	829	1,000	1,000	1,520	1,400	829	604	1,300	675	1,630
28	750	675	913	913	1,000	1,630	1,300	604	750	1,400	1,860	1,630
29	913	469	675	829	.....	1,400	829	1,000	750	1,520	1,860	1,740
30	347	535	604	1,100	.....	1,520	406	1,100	535	188	1,980	1,630
31	675	.....	829	829	.....	1,400	.....	1,000	.....	2,220	1,980	.....
1911-12.												
1	1,520	1,860	675	.....	.....	.....	1,100	1,630	2,220	1,410	1,630	1,300
2	1,740	1,740	604	.....	.....	.....	1,520	1,630	1,860	1,300	1,740	3,070
3	1,740	1,740	750	.....	.....	.....	1,520	1,300	1,630	1,300	1,860	3,980
4	1,630	1,100	675	.....	.....	.....	1,740	1,860	1,300	604	1,200	3,720
5	1,630	913	829	.....	.....	.....	2,220	1,630	1,980	1,400	1,740	4,110
6	2,220	1,400	604	.....	.....	.....	2,580	1,740	1,740	1,630	1,980	4,370
7	2,940	1,300	829	.....	.....	.....	2,820	1,630	1,630	347	2,460	3,850
8	3,460	1,200	750	.....	.....	.....	2,340	1,520	1,520	1,400	3,070	3,070
9	3,850	1,200	829	.....	.....	.....	2,700	1,630	1,200	1,520	3,850	3,590
10	3,590	1,100	1,200	.....	.....	.....	2,700	1,860	1,300	1,630	4,370	3,330
11	3,330	1,200	1,400	.....	.....	.....	2,700	1,980	1,400	1,300	4,890	3,070
12	3,330	1,000	1,860	.....	.....	.....	2,820	1,200	1,520	1,400	4,370	3,070
13	2,940	1,100	1,630	.....	.....	.....	2,820	1,300	1,630	1,300	4,370	3,070
14	2,940	829	1,630	.....	.....	.....	1,740	1,740	1,000	238	4,110	3,070
15	1,980	750	1,630	.....	.....	.....	2,700	1,630	1,100	1,400	3,850	1,200
16	2,940	750	1,860	.....	.....	.....	2,700	1,200	535	1,630	3,980	2,100
17	2,820	750	1,400	.....	.....	.....	2,580	1,740	1,200	1,520	3,720	1,860
18	2,940	750	1,630	.....	.....	.....	2,580	1,630	1,200	1,200	1,200	1,860
19	2,220	913	1,860	.....	.....	.....	2,220	1,100	1,630	1,300	3,460	1,630
20	1,980	675	1,630	.....	.....	.....	1,860	1,520	1,100	1,630	3,070	1,520
21	3,330	750	1,520	.....	.....	.....	1,980	1,630	1,200	347	3,200	1,740
22	3,850	829	1,520	.....	.....	.....	2,100	1,300	1,400	1,200	3,070	1,300
23	3,200	675	1,630	.....	.....	.....	1,860	1,630	291	1,200	2,940	1,400
24	3,070	750	1,860	.....	.....	.....	1,740	1,740	1,300	1,300	2,820	1,520
25	2,700	913	2,100	.....	.....	.....	1,740	1,860	1,630	1,630	1,400	1,860
26	2,940	1,100	1,860	.....	.....	.....	1,630	1,740	1,300	1,630	2,580	1,860
27	3,330	750	1,300	.....	.....	.....	1,520	1,630	1,200	1,860	2,820	1,520
28	2,940	1,000	1,520	.....	.....	.....	1,630	1,630	1,200	1,200	3,070	1,520
29	2,700	829	1,630	.....	.....	.....	2,820	1,860	1,100	1,980	2,820	1,200
30	2,580	675	1,630	.....	.....	.....	2,580	2,100	406	1,630	2,700	1,740
31	1,520	.....	1,520	.....	.....	.....	.....	1,980	.....	1,630	2,820	.....

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Daily discharge, in second-feet, of Wisconsin River near Rhinelander, Wis., for the years ending Sept. 30, 1910–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1912–13.												
1	1,740	1,630	535	1,000	750	1,000	1,520	2,220	1,740	675	1,630	1,300
2	1,860	1,860	2,100	913	535	535	1,200	1,860	2,100	913	1,100	1,000
3	1,400	1,100	1,860	829	675	1,100	2,340	1,860	2,100	675	1,740	1,400
4	1,630	1,860	1,630	829	675	1,200	1,860	1,000	1,860	406	1,000	1,630
5	2,100	2,340	1,860	829	750	913	2,340	1,630	2,100	829	913	1,300
6	829	2,100	2,100	913	750	1,100	2,340	1,200	1,860	347	829	1,000
7	1,520	1,860	1,860	750	675	1,200	2,220	1,300	1,860	675	1,300	535
8	1,980	1,980	829	675	675	913	2,220	913	829	1,000	1,630	1,300
9	2,100	1,860	1,740	750	469	1,200	1,980	1,200	2,220	829	1,100	913
10	1,630	1,400	2,100	829	913	1,100	2,460	1,200	1,980	1,200	291	1,400
11	1,520	1,740	1,520	829	750	1,100	2,220	535	1,740	913	675	1,000
12	1,980	1,980	1,630	535	675	1,000	1,980	1,200	1,980	1,300	750	1,000
13	604	1,860	1,860	913	675	1,000	604	1,300	1,520	406	1,100	1,300
14	1,740	1,740	1,860	675	604	829	2,220	1,000	1,630	1,860	1,000	347
15	2,100	1,740	675	750	913	1,300	2,220	1,300	675	2,220	1,200	1,000
16	1,630	1,630	1,860	750	291	1,200	2,460	1,300	675	1,980	829	913
17	1,740	1,200	1,630	750	829	913	2,220	1,000	829	1,630	142	913
18	1,520	1,860	1,740	750	675	1,000	1,980	675	913	1,860	1,200	913
19	1,980	1,860	1,520	535	675	1,300	2,340	1,980	675	2,100	1,200	750
20	1,200	1,980	1,630	829	1,200	1,200	2,220	2,340	913	469	829	1,000
21	1,860	1,740	1,400	535	604	913	2,220	2,220	829	1,100	1,000	604
22	1,860	1,980	1,100	535	675	1,400	1,980	1,980	406	913	1,000	1,520
23	1,630	1,740	1,300	675	913	1,300	2,460	1,740	675	829	1,200	1,740
24	1,740	1,100	1,100	675	750	1,300	2,220	1,860	829	1,300	188	1,520
25	1,980	1,860	1,300	750	1,000	1,000	2,460	1,980	829	1,100	1,200	1,860
26	1,740	1,740	1,000	535	1,100	1,000	1,860	1,980	913	1,860	1,200	1,860
27	1,000	1,860	1,300	675	675	1,300	1,980	2,100	829	1,520	1,400	1,400
28	1,740	1,630	1,300	750	829	1,100	2,220	2,100	675	2,700	1,000	829
29	1,980	1,630	1,100	675	.....	1,630	2,220	1,980	469	2,700	913	1,630
30	1,630	1,520	1,000	750	.....	1,520	2,100	2,100	1,100	2,700	1,300	1,630
31	1,980	.....	1,100	750	.....	1,520	.....	2,220	.....	1,980	291	.....

NOTE.—Daily discharge computed from a rating curve fairly well defined between 469 and 3,070 second-feet (gage heights 2.0 and 4.5 feet) and poorly defined beyond those points. Daily discharge, Oct. 1 to Dec. 31, 1909, differ from that published in Water-Supply Paper 265 on account of a revision of the rating table.

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Monthly discharge of Wisconsin River near Rhinelander, Wis., for the years ending Sept. 30, 1910–1913.

Month.	Discharge in second-feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
1909-10.				
October	1,300	142	800	B.
November	2,220	913	1,520	B.
December	1,520	675	1,060	C.
January	1,630	829	1,160	C.
February	1,740	535	1,310	C.
March	1,860	347	1,130	B.
April	1,740	469	1,190	B.
May	1,400	238	986	B.
June	1,100	18	597	B.
July	1,200	18	539	B.
August	750	38	513	B.
September	1,000	38	594	B.
The year	2,220	18	947	
1910-11.				
October	1,100	238	558	B.
November	750	238	573	B.
December	913	188	537	C.
January	1,300	347	806	C.
February	1,300	347	799	C.
March	1,740	238	929	B.
April	1,630	347	1,110	B.
May	2,220	188	961	B.
June	1,300	291	716	B.
July	2,820	188	1,120	B.
August	2,220	347	1,770	B.
September	1,980	406	1,440	B.
The year	2,820	188	944	
1911-12.				
October	3,850	1,520	2,710	B.
November	1,860	675	1,020	B.
December	2,100	604	1,370	C.
April	2,820	1,100	2,190	B.
May	2,100	1,100	1,630	B.
June	2,220	291	1,320	B.
July	1,980	238	1,320	B.
August	4,890	1,200	2,940	B.
September	4,370	1,200	2,420	B.
1912-13.				
October	2,100	604	1,680	B.
November	2,340	1,100	1,750	B.
December	2,100	535	1,470	C.
January	1,000	535	740	C.
February	1,200	469	739	C.
March	1,630	535	1,130	C.
April	2,460	604	2,090	B.
May	2,340	535	1,590	C.
June	2,220	406	1,260	C.
July	2,700	347	1,320	B.
August	1,740	142	1,000	B.
September	1,860	347	1,180	B.
The year	2,460	142	1,330	

NOTE.—See footnote to table of daily discharge. Monthly discharge, October, November, and December, 1909, differ from that published in Water-Supply Paper 265 on account of a revision of the rating curve. Discharge in "Second-feet per square mile" and "Run-off (depth in inches on drainage area)" are not published because they are believed to be misleading. See "Regulation" is station description.

WISCONSIN RIVER AT MERRILL, WIS.

Location.—At highway bridge at east end of the city of Merrill, 1,000 feet below power house and dam of Merrill Electric Railway & Power Co., and half a mile below the mouth of Prairie River coming in from right.

Records available.—November 17, 1902, to September 30, 1913.

Drainage area.—2,630 square miles.

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Gage.—Chain gage installed June 17, 1903; read twice daily from January to July, inclusive, and once daily—in the morning—from August to December. Datum unchanged since June 17, 1903. Records obtained from staff gage previously used doubtful. Because of an error in the gage, determined on August 15, 1913, gage heights from January 1 to December 31, 1912 (published in Water-Supply Paper 325), should be corrected by subtracting 0.07 foot. Gage heights from October 1 to December 31, 1912, have been corrected and should be used as published in the following table.

Channel and control.—Heavy gravel and rock; may scour in high water; probably permanent at other stages.

Discharge measurements.—Made from highway bridge.

Winter flow.—Little ice forms at the gage but ice forms on the right bank of the river below gage extending at times nearly to the center of the channel and causing a small amount of backwater at the gage.

Regulation.—Upstream from the gage are the following power plants, named in order:

Merrill: Merrill Electric Light & Railway Co.
Tomahawk: Tomahawk Pulp & Paper Co.
Tomahawk: Tomahawk Tannery Co.
Kings: Tomahawk Power Co.
Rhinelander: Rhinelander Paper Co.
Otter Rapids: Eagle River Electric Co.

All these plants control the flow somewhat by means of service reservoirs. The plant at Otter Rapids has a pondage with an area of 5 square miles. Besides the regulation of the above plants, the Wisconsin Valley Improvement Co. operates 17 storage reservoirs in the Wisconsin basin above Merrill, having a capacity of over 4,000,000,000 cubic feet.

Floods.—On July 24, 1912, at 5 a. m., the water reached a stage of approximately 17.5 feet, corresponding to a discharge of 45,000 second-feet. During the preceding 24 hours 11.25 inches of rain had fallen in the vicinity of Merrill. C. B. Stewart,[1] consulting engineer, Madison, estimated the run-off of the 700 square miles between Merrill and Tomahawk at 65 second-feet per square mile, and that from the entire drainage area above Merrill, at 17 second-feet per square mile. In the basin above Tomahawk, however, little rain had fallen.

Accuracy.—Accuracy of records impaired by diurnal fluctuations caused by the operation of power plants, in the winter by ice, and in the spring possibly by logs lodging on the control and causing backwater.

Cooperation.—Station maintained in cooperation with the United States Weather Bureau, the Wisconsin Valley Improvement Co., and the Railroad Commission of Wisconsin.

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[1] Stewart, C. B., Investigation of flood flow on the watershed upper Wisconsin River: Western Soc. Eng. Jour., vol. 23, no. 4, April, 1913.

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The following discharge measurement was made by B. J. Peterson August 15, 1913: Gage height, 4.65 feet, discharge, 1,850 second-feet.

Daily gage height, in feet, of Wisconsin River at Merrill, Wis., for the year ending Sept. 30, 1913.

[A. F. Lueck, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	5.2	5.0	5.5	4.9	5.0	4.6	7.2	6.5	7.2	4.7	6.7	4.9
2	5.3	4.9	5.6	5.1	5.0	4.4	7.8	6.3	6.7	5.0	5.9	4.9
3	5.4	4.6	5.5	5.1	4.7	4.5	9.0	6.2	6.6	4.8	6.0	5.4
4	5.2	4.9	6.1	4.6	4.8	4.5	8.7	6.2	6.6	5.0	5.6	4.8
5	5.0	5.0	6.3	5.0	4.8	4.6	8.5	6.5	6.4	5.0	5.2	5.5
6	5.4	5.3	5.9	4.6	4.7	4.8	8.1	6.4	6.2	6.0	5.8	4.9
7	5.4	4.9	5.7	5.3	4.8	4.6	8.2	5.8	6.2	5.6	5.5	5.4
8	5.2	4.9	5.6	4.8	4.8	4.4	8.0	6.4	5.9	5.7	5.3	5.1
9	5.5	4.8	5.6	5.0	4.6	4.5	7.6	5.8	5.5	6.4	5.3	5.2
10	5.5	5.0	5.5	5.0	4.9	4.6	7.5	5.8	5.8	6.2	5.2	4.8
11	5.4	4.9	5.7	5.1	4.9	4.8	7.5	5.8	5.6	6.4	5.3	5.2
12	5.4	4.9	5.1	4.9	5.2	4.8	7.3	5.4	6.9	6.6	4.9	5.0
13	6.3	5.6	5.5	5.0	5.0	4.8	7.3	5.6	5.3	6.6	5.2	5.1
14	6.5	5.2	5.5	5.0	4.6	5.5	7.2	5.8	5.6	6.4	5.0	5.0
15	6.1	5.2	5.3	5.0	4.6	4.8	8.2	5.8	6.0	6.4	4.8	4.8
16	5.9	5.3	5.2	4.8	4.7	4.8	8.3	5.7	4.8	5.9	5.1	5.0
17	5.9	5.2	5.5	5.0	4.7	5.1	9.0	6.2	5.0	6.5	4.8	5.3
18	5.9	4.7	5.5	4.8	4.6	4.9	9.1	5.5	5.1	6.4	4.3	4.7
19	6.0	5.1	5.2	4.8	4.6	5.2	9.0	5.7	5.3	6.1	5.3	4.7
20	5.8	4.9	5.0	5.0	4.4	6.0	8.6	5.8	5.2	6.2	5.0	5.0
21	5.4	5.1	5.2	5.0	4.6	6.0	8.2	6.8	5.2	5.6	4.9	5.3
22	5.1	5.1	5.1	5.0	4.6	5.6	7.8	7.2	5.2	5.6	5.3	5.9
23	5.3	5.0	4.9	4.8	4.8	5.3	7.9	7.1	3.8	5.2	5.3	5.7
24	5.4	5.0	5.2	4.8	3.95	5.2	7.8	6.8	5.0	5.4	5.0	6.0
25	5.3	4.8	5.1	4.8	4.9	5.5	7.8	6.6	4.8	5.7	4.7	6.4
26	5.0	5.0	4.9	4.8	4.4	5.6	7.4	6.0	4.9	5.8	4.8	6.0
27	5.1	4.9	4.7	4.6	4.4	5.8	7.6	6.5	5.0	8.1	4.8	6.4
28	5.0	4.9	4.9	4.5	5.0	5.5	7.0	6.0	5.4	8.4	4.7	6.2
29	5.2	5.0	4.5	4.9	.....	6.0	6.6	6.4	4.8	8.2	5.1	5.7
30	5.0	5.0	4.7	4.7	.....	6.4	6.4	7.3	5.0	7.4	4.9	6.0
31	4.9	.....	5.1	4.8	.....	7.0	.....	7.2	.....	6.9	4.4	.....

NOTE.—Discharge relation probably not materially affected by ice during the year ending Sept. 30, 1913. Gage heights, Oct. 1 to Dec. 31, 1912, differ from those published in Water-Supply Paper 325 on account of an error in the gage. See "Gage."

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Daily discharge, in second-feet, of Wisconsin River at Merrill, Wis., for the years ending Sept. 30, 1910–1915.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1909–10.												
1	1,470	1,080	4,460	1,940	2,150	2,010	3,510	4,000	2,700	1,060	602	1,440
2	1,300	2,240	4,100	1,820	2,150	2,300	3,700	3,510	1,880	1,010	602	1,440
3	1,080	3,320	3,870	2,150	2,150	2,080	3,600	3,420	1,820	670	1,380	1,440
4	985	3,760	3,870	2,220	2,380	2,220	2,610	2,780	1,620	522	1,160	1,320
5	850	3,320	3,210	2,010	2,380	2,300	2,300	2,080	1,110	455	1,220	1,440
6	1,600	3,520	3,760	2,220	2,080	2,610	5,060	2,010	602	602	1,010	1,220
7	1,540	3,640	2,390	2,220	1,940	2,780	6,540	1,820	1,820	390	1,010	1,010
8	1,080	3,210	2,010	2,220	1,380	2,220	6,070	2,010	1,560	602	720	1,060
9	1,300	2,640	2,240	2,250	2,150	2,080	5,170	2,220	1,940	1,270	912	1,220
10	1,240	2,560	2,240	2,220	2,150	1,680	4,310	2,150	2,010	1,220	1,010	1,620
11	1,410	2,920	2,160	2,380	1,940	1,940	3,800	2,010	1,680	1,160	440	1,500
12	1,240	4,820	2,010	2,150	2,150	1,940	3,140	1,820	1,440	624	1,060	1,380
13	1,470	5,180	1,940	2,010	2,010	1,940	3,900	1,880	1,620	1,010	402	1,160
14	1,410	5,430	2,310	2,080	1,820	2,150	3,600	1,440	1,500	1,160	960	1,680
15	1,410	5,430	1,940	2,080	1,880	2,960	2,700	1,270	1,220	1,060	624	2,300
16	1,540	8,620	1,940	2,220	2,220	2,700	3,050	1,330	1,110	1,220	785	1,750
17	1,470	7,360	2,080	2,010	1,940	2,610	3,510	1,220	695	1,010	1,010	1,010
18	1,410	5,550	1,940	2,220	1,940	2,300	4,100	2,870	1,220	912	1,010	1,220
19	810	4,940	1,870	2,150	2,150	2,610	4,520	3,420	1,220	865	1,060	752
20	1,410	5,300	1,940	2,220	2,010	2,780	4,420	4,420	624	1,010	1,010	1,320
21	1,800	4,820	1,660	2,010	1,820	4,310	4,840	4,310	752	624	912	1,110
22	2,010	4,220	2,080	2,080	2,220	4,520	4,730	4,420	960	1,060	581	1,160
23	1,870	4,100	1,730	2,010	2,150	4,310	4,100	4,620	647	1,110	1,060	912
24	1,470	3,980	1,600	2,150	2,380	3,800	4,310	4,200	670	865	912	785
25	1,410	3,760	1,800	1,620	2,080	3,700	3,420	3,420	1,060	1,110	1,160	1,010
26	1,470	3,210	2,080	1,940	2,380	4,200	4,200	3,140	470	1,110	1,160	1,160
27	1,470	3,640	2,310	2,150	2,150	4,000	4,950	3,230	414	1,060	1,320	1,380
28	1,870	4,340	2,160	2,380	1,880	3,510	4,950	3,900	1,110	1,110	1,060	1,270
29	1,600	5,430	2,160	1,820	.....	3,600	4,730	2,610	1,110	1,110	960	752
30	1,540	5,060	1,940	1,820	.....	4,100	4,310	1,750	1,110	1,060	1,060	1,500
31	1,130	.....	1,660	2,010	.....	4,840	.....	2,220	.....	1,110	1,500	.....
1910–11.												
1	1,500	1,010	912	1,160	1,380	1,320	4,950	1,620	3,140	1,010	3,230	1,620
2	1,380	1,270	1,010	1,220	1,270	1,380	4,620	1,560	2,960	960	3,510	1,620
3	1,160	1,750	1,010	1,270	1,440	960	3,900	1,820	2,300	752	3,600	1,620
4	1,680	1,680	912	1,160	1,620	1,750	3,230	2,380	2,150	670	2,530	1,270
5	1,270	1,940	720	1,500	1,160	1,500	3,230	2,610	4,620	624	2,080	1,750
6	1,500	960	825	1,820	825	1,680	3,050	2,700	4,730	1,060	2,010	1,500
7	1,680	960	960	1,440	1,620	1,440	2,780	1,500	4,620	1,880	2,220	2,080
8	1,820	912	960	1,270	1,620	1,620	2,300	1,440	3,050	1,750	2,300	3,700
9	1,380	1,440	865	1,110	1,320	1,110	2,700	2,080	2,700	720	2,530	1,500
10	1,440	1,010	1,010	1,752	2,010	1,160	2,610	2,870	3,050	1,560	2,960	1,620
11	1,380	695	1,110	1,270	1,820	1,750	2,870	2,700	2,080	1,500	2,700	1,880
12	1,220	1,440	1,010	1,220	1,440	1,560	3,900	1,820	1,880	1,680	2,870	1,680
13	1,270	1,220	1,110	1,270	1,160	1,750	4,620	2,080	1,680	1,270	2,870	1,880
14	785	1,620	1,220	1,320	1,320	2,150	4,840	1,750	1,500	1,500	2,960	5,280
15	1,440	1,270	1,220	1,160	1,940	1,940	5,280	1,620	1,320	1,440	1,880	4,420
16	541	1,220	1,110	1,220	1,880	1,820	4,620	3,600	1,380	1,060	1,940	3,600
17	1,010	1,270	1,560	1,560	1,680	2,610	5,390	3,700	1,160	1,060	1,820	6,790
18	1,320	1,270	1,110	1,560	1,620	2,530	4,200	3,420	1,060	1,220	1,380	5,060
19	1,380	1,220	1,270	1,750	1,560	1,750	4,620	3,420	695	2,380	1,820	3,900
20	1,620	1,110	1,270	1,440	1,500	1,750	5,840	5,390	1,060	2,080	1,060	2,870
21	1,270	1,110	1,440	2,080	1,440	2,380	4,730	6,180	1,110	1,380	1,220	3,900
22	1,680	1,010	1,500	1,500	1,270	3,700	4,950	6,300	1,110	2,150	2,010	3,800
23	1,820	865	1,620	1,320	1,270	3,900	5,060	7,180	1,110	1,110	2,610	3,230
24	1,880	960	1,750	1,500	1,270	3,900	4,520	7,180	1,110	2,010	2,450	2,960
25	1,620	912	1,820	1,820	1,560	3,320	3,700	6,920	1,010	1,500	2,150	3,420
26	1,160	1,010	1,440	1,820	1,440	4,000	3,700	5,500	720	2,010	2,300	2,530
27	1,680	1,010	720	1,380	1,560	4,840	4,200	4,950	695	1,940	2,150	3,600
28	1,880	1,060	1,320	1,380	1,380	4,620	1,880	5,390	1,060	1,940	2,530	3,600
29	1,560	1,270	1,380	1,380	.....	5,170	2,610	3,700	1,110	1,940	2,010	4,200
30	1,440	1,010	1,500	1,320	.....	5,390	3,050	3,600	1,110	1,680	1,380	4,950
31	1,620	.....	1,820	1,680	.....	4,620	.....	3,320	.....	1,010	1,680	.....

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Daily discharge, in second-feet, of Wisconsin River at Merrill, Wis., for the years ending Sept. 30, 1910–1913—Continued.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1911-12.												
1	5,720	4,730	.....	.....	.....	.....	960	6,070	5,170	785	2,780	20,100
2	4,950	4,000	.....	.....	.....	.....	3,140	6,070	5,170	752	2,300	23,500
3	6,070	4,520	.....	.....	.....	.....	3,320	5,170	5,170	2,150	1,500	7,560
4	8,560	2,610	.....	.....	.....	.....	4,310	5,610	5,170	2,010	1,500	12,600
5	8,140	2,870	.....	.....	.....	.....	5,170	7,860	5,170	1,620	1,500	8,980
6	18,200	3,700	.....	.....	.....	.....	8,140	7,590	4,950	1,560	2,010	8,980
7	19,000	4,200	.....	.....	.....	.....	9,570	7,590	4,950	1,750	2,960	7,590
8	15,800	3,050	.....	.....	.....	.....	10,800	7,590	4,520	1,750	3,900	7,050
9	12,300	3,900	.....	.....	.....	.....	9,570	6,540	4,310	1,380	5,610	6,300
10	10,500	3,700	.....	.....	.....	.....	8,420	5,170	3,140	1,880	12,000	4,950
11	7,590	3,140	.....	.....	.....	.....	8,700	5,170	1,620	2,150	14,000	4,310
12	7,590	3,900	.....	.....	.....	.....	8,140	5,390	2,300	2,150	13,600	4,100
13	6,790	2,300	.....	.....	.....	.....	8,140	4,730	2,780	1,880	11,100	3,900
14	6,660	2,530	.....	.....	.....	.....	7,050	3,140	2,010	1,620	7,590	4,520
15	6,180	3,420	.....	.....	.....	.....	7,860	5,170	2,300	1,440	7,320	4,520
16	8,000	3,600	.....	.....	.....	.....	8,140	5,840	2,450	1,560	5,840	4,310
17	11,800	2,870	.....	.....	.....	.....	7,590	3,510	2,010	2,010	6,300	4,100
18	11,800	2,960	.....	.....	.....	.....	7,320	4,100	2,780	1,750	5,610	3,700
19	13,000	3,050	.....	.....	.....	.....	6,300	4,520	1,620	1,750	5,610	3,900
20	10,300	3,140	.....	.....	.....	.....	6,070	4,310	2,610	1,160	6,070	3,510
21	8,990	2,780	.....	.....	.....	.....	6,070	4,310	2,610	1,620	5,610	3,700
22	7,590	3,050	.....	.....	.....	.....	8,140	5,390	2,010	1,380	4,950	4,100
23	7,180	3,140	.....	.....	.....	.....	9,570	8,140	2,450	2,450	4,730	3,140
24	6,790	3,230	.....	.....	.....	.....	9,860	9,570	2,150	27,200	4,520	2,960
25	6,790	3,140	.....	.....	.....	.....	7,590	8,420	2,300	15,600	4,520	3,320
26	7,180	3,140	.....	.....	.....	.....	6,540	6,540	2,610	10,200	3,320	3,700
27	6,180	3,050	.....	.....	.....	.....	7,860	8,140	2,780	7,320	4,520	2,450
28	4,840	3,420	.....	.....	.....	.....	7,590	9,280	1,750	4,950	3,900	2,450
29	4,520	3,420	.....	.....	.....	.....	7,320	9,570	1,380	3,510	3,900	1,880
30	4,420	3,420	.....	.....	.....	.....	6,540	8,140	2,450	3,140	4,730	2,780
31	4,840	.....	.....	.....	.....	.....	.....	7,590	.....	2,780	5,170	.....
1912-13.												
1	2,610	2,300	3,140	2,150	2,300	1,750	6,790	5,170	6,790	1,880	5,610	2,150
2	2,780	2,150	3,320	2,450	2,300	1,500	8,420	4,730	5,610	2,300	3,900	2,150
3	2,960	1,750	3,140	2,450	1,880	1,620	12,000	4,520	5,390	2,010	4,100	2,960
4	2,610	2,150	4,310	1,750	2,010	1,620	11,100	4,520	5,390	2,300	3,320	2,010
5	2,300	2,300	4,730	2,300	2,010	1,750	10,500	5,170	4,950	2,300	2,610	3,140
6	2,900	2,780	3,900	1,750	1,880	2,010	9,280	4,950	4,520	4,100	3,700	2,150
7	2,900	2,150	3,510	2,780	2,010	1,750	9,570	3,700	4,520	3,320	3,140	2,960
8	2,610	2,150	3,320	2,010	2,010	1,500	8,990	4,950	3,900	3,510	2,780	2,450
9	3,140	2,010	3,320	2,300	1,750	1,620	7,860	3,700	3,140	4,960	2,780	2,610
10	3,140	2,300	3,140	2,300	2,150	1,750	7,590	3,700	3,700	4,520	2,610	2,010
11	2,960	2,150	3,510	2,450	2,150	2,010	7,590	3,700	3,320	4,950	2,780	2,610
12	2,960	2,150	2,450	2,150	2,610	2,010	7,050	2,960	6,070	5,390	2,150	2,300
13	4,730	3,320	3,140	2,300	2,300	2,010	7,050	3,320	2,780	5,390	2,610	2,450
14	5,170	2,610	3,140	2,300	1,750	3,140	6,790	3,700	3,320	4,950	2,300	2,300
15	4,310	2,610	2,780	2,300	1,750	2,010	9,570	3,700	4,100	4,950	2,010	2,010
16	3,900	2,780	2,610	2,010	1,880	2,010	9,860	3,510	2,010	3,900	2,450	2,300
17	3,900	2,610	3,140	2,300	1,880	2,450	12,000	4,520	2,300	5,170	2,010	2,780
18	3,900	1,880	3,140	2,010	1,750	2,150	12,300	3,140	2,450	4,950	1,380	1,880
19	4,100	2,450	2,610	2,010	1,750	2,610	12,000	3,510	2,780	4,310	2,780	1,880
20	3,700	2,150	2,300	2,300	1,500	4,100	10,800	3,700	2,610	4,520	2,300	2,300
21	2,960	2,450	2,610	2,300	1,750	4,100	9,570	5,840	2,610	3,320	2,150	2,780
22	2,450	2,450	2,450	2,300	1,750	3,320	8,420	6,790	2,610	3,320	2,780	3,900
23	2,780	2,300	2,150	2,010	2,010	2,780	8,700	6,540	865	2,610	2,780	3,510
24	2,960	2,300	2,610	2,010	1,010	2,610	8,420	5,840	2,300	2,960	2,300	4,100
25	2,780	2,010	2,450	2,010	2,150	3,140	8,420	5,390	2,010	3,510	1,880	4,960
26	2,300	2,300	2,150	2,010	1,500	3,320	7,320	4,100	2,150	3,700	2,010	4,100
27	2,450	2,150	1,880	1,750	1,500	3,700	7,860	5,170	2,300	9,280	2,010	4,960
28	2,300	2,150	2,150	1,620	2,300	3,140	6,300	4,100	2,960	10,200	1,880	4,520
29	2,610	2,300	1,620	2,150	.....	4,100	5,390	4,950	2,010	9,570	2,450	3,510
30	2,300	2,300	1,880	1,880	.....	4,950	4,950	7,050	2,300	7,320	2,150	4,100
31	2,150	.....	2,450	2,010	.....	6,300	.....	6,790	.....	6,070	1,500	.....

NOTE.—Daily discharge computed from a rating curve fairly well defined between 785 and 12,000 second-feet (gage heights 3.7 and 9.0 feet); below 785 second-feet (gage height 3.7 feet), the rating curve is simply an extension, and estimates should be used with caution. No discharge estimates have been made Dec. 1, 1911, to Mar. 31, 1912, as discharge relation was probably seriously affected by ice. Discharge for winter periods of the other years determined from open-water rating, may be too high.

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Monthly discharge of Wisconsin River at Merrill, Wis., for the years ending Sept. 30, 1910–1913.

[Drainage area, 2630 square miles.[a]]

Month.	Discharge in second-feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
1909–10.				
October	2,010	810	1,410	C.
November	8,620	1,080	4,250	C.
December	4,460	1,600	2,370	C.
January	2,380	1,620	2,090	D.
February	2,380	1,380	2,070	D.
March	4,840	1,680	2,940	D.
April	6,540	2,300	4,140	C.
May	4,620	1,220	2,760	B.
June	2,700	414	1,260	C.
July	1,270	390	941	C.
August	1,500	402	957	C.
September	2,300	752	1,280	C.
The year	8,620	390	2,200	
1910–11.				
October	1,880	541	1,430	C.
November	1,940	695	1,180	C.
December	1,820	720	1,210	C.
January	2,080	752	1,410	C.
February	2,010	825	1,480	C.
March	5,390	960	2,560	C.
April	5,840	1,880	3,930	C.
May	7,180	1,440	3,560	C.
June	4,730	695	1,910	C.
July	2,380	624	1,450	C.
August	3,600	1,060	2,280	C.
September	6,790	1,270	3,060	C.
The year	7,180	541	2,120	
1911–12.				
October	19,000	4,420	8,650	B.
November	4,730	2,300	3,330	B.
April	10,800	960	7,190	B.
May	9,570	3,140	6,330	B.
June	5,170	1,380	3,090	B.
July	27,200	752	3,650	C.
August	14,000	1,500	5,450	C.
September	23,500	1,880	5,970	C.
1911–23.				
October	5,170	2,150	3,090	B.
November	3,320	1,750	2,320	B.
December	4,730	1,620	2,870	B.
January	2,780	1,620	2,140	D.
February	2,610	1,010	1,910	D.
March	6,300	1,500	2,670	D.
April	12,300	4,950	8,750	B.
May	7,050	2,960	4,630	B.
June	6,790	865	3,390	B.
July	10,200	1,880	4,570	B.
August	5,610	1,380	2,620	B.
September	4,950	1,880	2,930	B.
The year	12,300	865	3,490	

[a] Estimates of discharge in "Second-feet per square mile" and "Run-off (depth in inches on drainage area)" withheld as misleading. See "Regulation" in station description.

NOTE.—See footnote to table of daily discharge.

WISCONSIN RIVER, NEAR NECEDAH, WIS.

Location.—At highway bridge known as Pete in Well Bridge, about 3 miles east of Necedah, Wis., on the road from Necedah to Strongs Prairie, about 5 miles above mouth of Big Roche a Cri Creek (entering from the left).

Records available.—December 2, 1902, to September 30, 1913.

Drainage area.—5,800 square miles.

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Gage.—Chain gage attached to bridge. Gage heights for the year 1909 (published in Water-Supply Paper 265) are approximately 0.04 too high; gage heights for 1910 (Water-Supply Paper 285) approximately 0.08 too high; gage heights for 1911 (Water-Supply Paper 305) approximately 0.13 too high; gage heights January to September, 1912 (Water-Supply Paper 325) approximately 0.17 too high; gage heights for October to December, 1912, should be used as given in the following tables; gage heights for 1913 refer to original datum.

Channel and control.—Sandy and shifting.

Floods.—The highest stage recorded at this station is 16.8 feet on October 10, 1911.

Winter flow.—Discharge relation greatly modified by ice which forms at the gage to a thickness of 1 to 2 feet.

Accuracy.—Owing to the fact that the bed of the river shifts considerably, estimates based on occasional discharge measurements should be used with great caution. Discharge measurements made in 1910 and 1913 indicate a change in the discharge relation ranging from about 10 per cent at high stage to about 50 per cent at low water. Estimates of discharge for this period have not been prepared as the data available are not sufficient to warrant their publication.

Cooperation.—Gage heights furnished by courtesy of Wisconsin Valley Improvement Co.

The following discharge measurement was made by B. J. Peterson: August 18, 1913: Gage height, 5.13 feet; discharge, 2,670 second-feet.

Daily gage height, in feet, of Wisconsin River near Necedah, Wis., for the year ending Sept. 30, 1913.

[Michael Coughlin, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	6.6	5.8	5.3	7.3	6.6	6.5	8.6	8.2	10.0	6.3	9.2	5.2
2	6.4	5.8	5.5	7.1	.....	.....	9.6	8.1	10.1	6.0	8.4	4.9
3	6.3	5.8	6.0	7.0	.....	.....	11.1	7.7	9.6	6.0	6.9	5.5
4	6.0	5.6	6.2	6.9	.....	.....	12.0	7.4	8.3	5.8	7.3	5.2
5	6.1	5.8	7.0	.....	.....	.....	12.7	7.4	8.0	5.8	6.4	5.4
6	6.3	5.2	7.5	.....	.....	.....	13.7	7.4	7.6	6.2	5.9	5.3
7	5.9	5.8	7.7	.....	.....	.....	13.9	7.5	7.4	6.2	6.1	5.6
8	6.2	5.7	7.9	.....	6.4	6.5	13.6	8.4	7.2	6.4	6.0	5.0
9	6.1	5.7	6.6	.....	.....	.....	11.7	8.0	7.2	7.1	6.0	5.5
10	6.2	5.6	6.3	.....	.....	.....	11.1	7.8	6.9	7.4	6.1	5.6
11	6.0	5.4	6.6	6.9	.....	.....	10.1	7.7	7.6	7.6	5.9	5.7
12	6.2	5.8	7.9	.....	.....	.....	10.5	7.6	6.3	7.5	6.1	5.3
13	6.4	5.8	8.3	.....	.....	.....	10.6	7.3	6.2	7.5	5.9	5.3
14	6.2	5.7	8.5	.....	.....	.....	10.6	7.2	6.5	7.5	6.2	5.2
15	7.4	6.1	8.7	.....	.....	8.5	10.6	7.4	6.4	8.4	5.5	5.0
16	7.5	6.1	8.2	.....	6.4	9.7	10.6	7.1	6.2	7.8	5.6	5.2
17	7.2	6.0	8.3	.....	.....	10.6	10.6	7.7	6.7	7.6	5.7	4.9
18	7.1	5.9	8.5	6.7	.....	11.8	10.4	8.9	6.5	7.4	5.7	5.2
19	7.0	6.0	8.1	.....	.....	13.4	10.6	8.7	6.4	7.4	5.6	5.2
20	6.6	5.9	8.2	.....	.....	9.3	10.8	9.0	6.2	7.6	5.2	5.3
21	6.2	5.7	8.3	.....	.....	9.2	10.9	8.7	6.6	7.6	5.2	5.2
22	6.4	5.9	7.3	.....	6.4	9.0	10.6	8.6	7.0	7.5	5.4	5.1
23	6.4	5.8	8.1	.....	.....	9.8	9.9	9.9	7.2	7.4	5.5	5.3
24	6.0	5.8	7.9	.....	.....	9.8	9.8	10.6	6.8	6.7	5.0	5.8
25	6.1	6.2	7.8	6.5	.....	9.3	9.7	10.6	6.8	6.6	5.3	5.8
26	6.3	6.0	7.8	.....	.....	9.3	9.1	9.6	6.3	6.3	5.5	6.4
27	6.2	5.8	7.5	.....	.....	9.0	9.2	8.9	6.4	6.2	5.4	6.3
28	6.0	5.8	7.4	.....	.....	9.0	8.9	8.4	6.3	6.1	5.3	6.6
29	6.2	5.6	7.4	.....	.....	9.4	8.7	8.0	6.8	7.7	5.4	6.4
30	6.0	5.4	7.3	.....	.....	8.2	8.4	8.9	7.3	9.4	5.4	6.4
31	5.8	.....	7.6	.....	.....	8.0	.....	9.0	.....	9.8	5.3	.....

NOTE.—Discharge relation affected by ice about Dec. 1, 1912, to Mar. 20, 1913.

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TURKEY RIVER AT GARBER, IOWA.

Location.—At single-span highway bridge at Garber, 800 feet above mouth of Wayne Creek, which enters from the right.

Records available.—August 29 to September 30, 1913.

Drainage area.—1,560 square miles.

Gage.—Chain gage attached to the bridge, read morning and evening to quarter-tenths. Limits of use: Hundredths below 3.0, half-tenths from 3.0 to 4.0, and tenths above 4.0 feet.

Channel and control.—Sand and mud; shifting.

Discharge measurements.—Made from the bridge or, at low water, by wading.

Regulation.—The operation of an electric-light plant and grist mill at Elkader probably produces a slight daily fluctuation.

Floods.—What is probably the highest stage within the past 20 years occurred May 18, 1902, when the river reached a stage indicated by high-water mark on door of A. F. Grafe's residence in Garber about 23.7 feet above gage datum.

Accuracy.—Gage-height record reliable; data insufficient for estimates of discharge.

Discharge measurements of Turkey River at Garber, Iowa, during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Aug. 8	W. G. Hoyt	2.80	181
29	B. J. Peterson	2.88	151

Daily gage height, in feet, of Turkey River at Garber, Iowa, for the year ending Sept. 30, 1913.

[E. J. Prolow, observer.]

Day.	Aug.	Sept.	Day.	Aug.	Sept.	Day.	Aug.	Sept.
1		2.90	11		3.3	21		3.5
2		2.90	12		3.0	22		3.2
3		2.80	13		2.90	23		3.0
4		2.75	14		2.90	24		2.96
5		2.72	15		2.90	25		2.96
6		2.75	16		3.2	26		3.1
7		2.72	17		2.95	27		2.99
8		3.9	18		2.82	28		2.94
9		3.0	19		2.81	29	2.88	2.90
10		2.81	20		4.1	30	2.92	3.2
						31	2.92	

MAQUOKETA RIVER ABOVE MOUTH OF NORTH FORK OF MAQUOKETA RIVER, NEAR MAQUOKETA, IOWA.

Location.—At the Goddard Bridge, about 6 miles west of Maquoketa, about 1,000 feet above mouth of Punkin Run entering from the right, and about 7 miles above mouth of North Fork of Maquoketa River.

Records available.—August 31 to September 30, 1913.

Drainage area.—957 square miles.

Gage.—Chain gage attached to the bridge; read once daily, in the morning, to half-tenths. Limits of use: Half-tenths below and tenths above 3.0 feet.

Channel and control.—Control not well defined; channel somewhat shifting.

Discharge measurements.—Made from the bridge.

Regulation.—The operation of a grist mill at Canton, about 12 miles upstream, probably produces a slight daily fluctuation at the gage.

Accuracy.—Gage-height record reliable. Data insufficient for estimates of discharge.

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The following discharge measurement was made by S. B. Soulé:
August 31, 1913: Gage height, 2.01 feet; discharge, 194 second-feet.

Daily gage height, in feet, of Maquoketa River above mouth of North Fork Maquoketa River near Maquoketa, Iowa, for the year ending Sept. 30, 1913.

[Frank Prindle, observer.]

Day.	Sept.	Day.	Sept.	Day.	Sept.
1	1.95	11	2.0	21	2.2
2	2.0	12	2.0	22	2.2
3	1.9	13	2.1	23	2.2
4	1.95	14	2.05	24	2.15
5	2.0	15	2.0	25	2.1
6	2.0	16	2.1	26	2.15
7	2.1	17	2.0	27	2.1
8	1.9	18	2.15	28	2.1
9	2.0	19	2.1	29	2.0
10	1.95	20	2.1	30	2.1

MAQUOKETA RIVER BELOW MOUTH OF NORTH FORK OF MAQUOKETA RIVER, NEAR MAQUOKETA, IOWA.

Location.—In the southwest corner of the NE. ¼ sec. 17, T. 84 N., R. 3 E., at the Bridgeport Bridge, about 3 miles northeast of Maquoketa, 1,200 feet above the mouth of Mill Creek which enters from the right, and about 2 miles below the mouth of North Fork Maquoketa River.

Records available.—September 1 to 30, 1913.

Drainage area.—1,570 square miles.

Channel and control.—Control not well defined; channel shifting.

Discharge measurements.—Made from bridge.

Regulation.—Practically none.

Accuracy.—Gage-height record reliable; data inadequate for estimates of discharge.

Discharge measurements of Maquoketa River below mouth of North Fork Maquoketa River near Maquoketa, Iowa, during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Aug. 21	W. G. Hoyt	2.87	564
30	S. B. Soulé	2.30	396

Daily gage height, in feet, of Maquoketa River below mouth of North Fork of Maquoketa River, near Maquoketa, Iowa, for the year ending Sept. 30, 1913.

[John Strodthoff, observer.]

Day.	Sept.	Day.	Sept.	Day.	Sept.
1	2.25	11	2.22	21	2.55
2	2.30	12	2.22	22	2.50
3	2.28	13	2.28	23	2.48
4	2.25	14	2.41	24	2.38
5	2.25	15	2.28	25	2.40
6	2.25	16	2.30	26	2.32
7	2.25	17	2.38	27	2.38
8	2.22	18	2.35	28	2.30
9	2.22	19	2.32	29	2.35
10	2.22	20	2.48	30	2.30

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WAPSIPINICON RIVER AT STONE CITY, IOWA.

Location.—At the highway bridge at Stone City, Iowa, a short distance above the Chicago, Milwaukee & St. Paul Railway bridge, about 4 miles above the mouth of Buffalo Creek.

Records available.—August 19, 1903, to September 30, 1913.

Drainage area.—1,310 square miles.

Gage.—Chain gage attached to bridge; read daily, in the morning, to quarter-tenths. Limits of use: Hundredths below 3.0, half-tenths from 3.0 to 4.0, and tenths above 4.0 feet.

Channel and control.—Remains of a loose rock dam under the Chicago, Milwaukee & St. Paul Railway bridge, practically permanent, forms the control.

Discharge measurements.—Made from upstream side of bridge.

Floods.—The high water of July, 1892, reached a stage of 28 feet referred to the present gage. According to the observer, this record is probably correct within one-half foot.

Winter flow.—Discharge relaton affected by ice that forms to a thickness of 1 to 2i feet.

Regulation.—The operation of a power plant installed in 1912 at Center City, about 20 miles above the station, may possibly cause some diurnal fluctuation at the gage.

Cooperation.—Gage heights furnished by Frank Dearborn, of Stone City, Iowa.

Discharge measurements of Wapsipinicon River at Stone City, Iowa, during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Nov. 9	S. B. Soulé	2.95	198
Sept. 2	B. J. Peterson	2.38	71.6

Daily gage height, in feet, of Wapsipinicon River at Stone City, Iowa, for the year ending Sept. 30, 1913.

[Frank Dearborn, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3.2	3.05	3.3	3.1	.....	.....	6.6	3.3	6.5	2.80	2.65	2.38
2	3.25	3.0	3.1	.....	.....	.....	6.1	3.3	5.7	2.88	2.62	2.42
3	3.1	3.05	3.1	.....	.....	.....	5.8	3.25	4.9	2.72	2.68	2.36
4	3.05	3.25	3.1	.....	.....	.....	5.6	3.6	4.7	2.70	2.58	2.40
5	3.0	3.05	2.72	.....	2.65	3.1	5.6	4.0	4.4	2.72	2.58	2.38
6	2.88	3.0	2.94	.....	.....	.....	5.3	4.4	4.2	2.68	2.56	2.38
7	2.96	3.0	3.2	.....	.....	.....	5.2	4.6	4.6	3.75	2.36	2.38
8	2.85	2.90	3.2	3.1	.....	.....	5.2	4.7	3.95	2.68	2.35	2.45
9	3.3	3.0	3.15	.....	.....	5.6	5.8	4.6	4.0	3.2	2.44	2.64
10	3.65	2.98	3.2	.....	.....	5.9	6.4	4.3	3.9	2.82	2.55	2.40
11	3.9	3.0	3.2	.....	.....	6.0	6.6	4.0	3.7	2.56	2.48	2.48
12	3.75	2.96	3.15	.....	2.48	6.2	6.6	4.3	3.8	2.55	2.78	2.43
13	4.15	3.3	3.1	.....	.....	6.6	6.7	4.4	3.65	2.52	2.63	2.40
14	3.95	3.5	3.1	.....	.....	7.8	6.4	4.7	3.7	2.56	2.40	2.38
15	3.65	3.45	.....	3.1	.....	9.0	6.1	5.1	3.7	2.58	2.95	2.33
16	3.35	3.5	.....	.....	.....	9.6	5.6	5.0	3.9	2.62	2.80	2.40
17	3.45	3.35	.....	.....	.....	10.1	5.4	5.3	3.55	2.97	2.62	2.40
18	3.3	3.15	3.1	.....	.....	10.4	5.4	5.3	3.5	2.92	2.47	2.42
19	3.3	3.05	.....	.....	2.82	10.5	4.9	4.8	3.3	2.80	2.55	2.58
20	3.25	3.1	.....	.....	.....	9.8	4.7	4.9	3.4	2.56	2.42	2.55
21	3.3	3.1	.....	.....	.....	9.0	4.6	5.8	3.35	2.57	2.52	2.40
22	3.25	3.0	.....	3.0	.....	8.8	4.4	6.5	3.3	2.59	2.70	2.40
23	3.1	3.0	.....	.....	.....	8.4	4.0	7.2	3.35	2.78	2.45	2.45
24	3.2	3.0	.....	.....	.....	10.2	3.85	8.9	3.3	2.72	2.42	2.60
25	3.15	3.0	.....	.....	.....	10.5	3.7	9.3	3.45	2.60	2.35	2.42
26	3.0	2.98	3.1	.....	2.75	10.1	3.5	8.2	3.35	2.56	2.35	2.40
27	3.1	2.95	.....	.....	.....	9.8	3.35	7.9	3.35	2.62	2.33	2.38
28	2.98	2.98	.....	.....	.....	8.6	3.55	8.3	3.95	2.71	2.38	2.38
29	3.15	3.0	.....	2.8	.....	7.4	3.55	9.2	3.35	2.82	2.38	2.40
30	3.0	3.9	.....	.....	.....	7.2	3.35	9.4	2.7	2.70	2.40	2.48
31	3.1	.....	.....	.....	.....	7.1	.....	8.1	.....	2.63	2.42	.....

NOTE.—Discharge relation affected by ice about Dec. 7, 1912, to Mar. 8, 1913.

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Daily discharge, in second-feet, of Wapsipinicon River at Stone City, Iowa, for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	295	238	335	.....	.....	.....	2,120	335	2,060	164	126	71
2	315	220	255	.....	.....	.....	1,820	335	1,590	185	119	78
3	255	238	255	.....	.....	.....	1,640	315	1,150	143	133	68
4	238	315	255	.....	.....	.....	1,540	465	1,040	138	110	74
5	220	238	143	.....	.....	.....	1,540	660	875	143	110	71
6	185	220	202	.....	.....	.....	1,370	875	765	133	105	71
7	208	220	.....	.....	.....	.....	1,320	985	985	535	68	71
8	177	190	.....	.....	.....	.....	1,320	1,040	635	133	66	83
9	335	220	.....	.....	.....	1,540	1,640	985	660	205	81	124
10	488	214	.....	.....	.....	1,700	2,000	820	610	169	103	74
11	610	220	.....	.....	.....	1,760	2,120	660	510	105	88	88
12	535	208	.....	.....	.....	1,880	2,120	820	560	103	159	79
13	738	335	.....	.....	.....	2,120	2,180	875	488	96	121	74
14	635	420	.....	.....	.....	2,940	2,000	1,040	510	105	74	71
15	488	398	.....	.....	.....	3,840	1,820	1,260	510	110	205	63
16	355	420	.....	.....	.....	4,320	1,540	1,200	610	119	164	74
17	398	355	.....	.....	.....	4,720	1,420	1,370	442	211	119	74
18	335	275	.....	.....	.....	4,980	1,420	1,370	420	196	87	78
19	335	238	.....	.....	.....	5,070	1,150	1,100	335	164	103	110
20	315	255	.....	.....	.....	4,480	1,040	1,150	375	105	78	103
21	335	255	.....	.....	.....	3,840	985	1,640	355	107	96	74
22	315	220	.....	.....	.....	3,690	875	2,060	335	112	138	74
23	255	220	.....	.....	.....	3,390	660	2,520	355	159	83	83
24	295	220	.....	.....	.....	4,800	585	3,760	335	143	78	114
25	275	220	.....	.....	.....	5,070	510	4,080	398	114	66	78
26	220	214	.....	.....	.....	4,720	420	3,240	355	105	66	74
27	255	205	.....	.....	.....	4,480	355	3,020	355	119	63	71
28	214	214	.....	.....	.....	3,540	442	3,320	635	141	71	71
29	275	220	.....	.....	.....	2,660	442	4,000	355	169	71	74
30	220	610	.....	.....	.....	2,520	355	4,160	138	138	74	88
31	255	.....	.....	.....	.....	2,450	.....	3,160	.....	121	78	.....

NOTE.—Daily discharge computed from a rating curve well defined between 58 and 2,380 second-feet (gage heights, 2.3 and 7.0 feet). Discharge estimated, because of ice, from gage heights, observer's notes, climatic records, and discharge of adjacent drainage areas, as follows: Dec. 7-31, 1912, 170 second-feet; Jan. 1-31, 1913, 170 second-feet; Feb. 1-28, 140 second-feet; and Mar. 1-8, 300 second-feet.

Monthly discharge of Wapsipinicon River at Stone City, Iowa, for the year ending Sept. 30, 1913.

[Drainage area, 1,310 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	738	177	335	0.256	0.30	A.
November	610	190	268	.205	.23	A.
December	.....	.....	184	.140	.16	
January	.....	.....	170	.130	.15	
February	.....	.....	140	.107	.11	
March	5,070	.....	2,670	2.04	2.35	B.
April	2,180	355	1,290	.985	1.10	A.
May	4,160	315	1,700	1.30	1.50	B.
June	2,060	138	625	.477	.53	A.
July	535	96	154	.118	.14	A.
August	205	63	100	.076	.09	A.
September	124	63	80.0	.061	.07	A.
The year	5,070	.....	648	.495	6.73	

IOWA RIVER NEAR IOWA FALLS, IOWA.

Location.—About 1 mile above Iowa Falls and 2 miles below the Northwestern Railway bridge.

Records available.—August 5, 1911, to September 30, 1913.

Drainage area.—Not measured.

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Gage.—Vertical staff fastened to a maple tree on the north or left bank of the river, read morning and evening to quarter-tenths. Limits of use: Hundredths below 2.0, half-tenths from 2.0 to 3.0, and tenths above 3.0 feet.

Channel and control.—Rock; permanent.

Discharge measurements.—At low water made by wading in the vicinity of the gage; at high stages from Illinois Central Railroad bridge one-fourth mile from depot. A small creek enters from the left between the bridge and gage.

Winter flow.—Discharge relation affected by ice.

Regulation.—A dam 7 miles above the gage at Alden is used occasionally. It is thought that the flow at the gage is the natural flow of the stream.

Data inadequate for estimates of discharge.

Discharge measurements of Iowa River near Iowa Falls, Iowa, during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 7	Lees and Soulé	0.61	28.1	Sept. 4	B. J. Peterson	0.48	10.6
7	do	.61	30.2	4	do	.48	11.1

NOTE.—Measurements made by wading.

Daily gage height, in feet, of Iowa River near Iowa Falls, Iowa, for the year ending Sept. 30, 1913.

[Albert Kulas, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	0.56	0.85	0.85	0.91	1.2	1.25	1.45	1.20	2.15	0.80	0.55	0.49
2	.72	.86	.85	1.00	1.2	1.2	1.39	1.12	1.95	.78	.60	.51
3	.60	.85	.74	1.04	1.2	1.4	1.38	1.08	1.75	.90	.48	.48
4	.60	.92	.88	.98	1.2	1.4	1.40	1.39	1.55	.82	.50	.49
5	.62	.82	.98	.88	1.25	1.3	1.40	1.6	1.48	.78	.54	.49
6	.62	.72	1.00	1.0	1.2	1.25	1.40	1.7	1.44	.71	.54	.49
7	.62	.68	1.00	1.05	1.15	1.3	1.45	1.65	1.29	.70	.59	.50
8	.72	.90	.94	1.0	1.2	1.8	1.75	1.6	1.26	.70	.44	.60
9	.65	.76	.95	.98	1.3	1.75	2.1	1.6	1.20	.68	.50	.65
10	.71	.78	.80	1.0	1.3	1.8	2.7	1.65	1.18	.65	.50	.50
11	.78	.72	.82	1.05	1.2	2.0	2.95	1.5	1.11	.68	.60	.55
12	.72	.79	.80	1.0	1.2	2.15	3.2	1.48	1.10	.79	.60	.65
13	1.05	.81	.85	1.05	1.3	2.25	3.2	1.5	1.02	.74	.70	.49
14	1.00	.82	.85	1.0	1.3	3.5	3.0	1.6	1.00	.70	.66	.52
15	1.00	.84	.86	1.05	1.3	4.8	2.65	2.05	1.00	.70	.65	.70
16	.94	.82	.90	1.05	1.25	5.1	2.35	2.3	.98	.70	.60	.52
17	.89	.85	.88	1.1	1.2	3.5	2.1	2.4	.94	.70	.62	.64
18	.84	.72	.89	1.1	1.2	2.8	1.9	2.5	.90	.78	.65	.48
19	.80	.66	.90	1.15	1.2	2.1	1.75	2.55	.89	.68	.59	.70
20	.81	.82	.90	1.2	1.2	2.0	1.55	2.7	.88	.44	.60	.65
21	.90	.81	.92	1.2	1.2	1.7	1.5	2.95	.89	.60	.60	.52
22	1.05	.84	.94	1.2	1.3	2.0	1.42	3.1	.88	.62	.65	.72
23	1.00	.88	.91	1.2	1.3	1.4	1.39	3.2	.80	.69	.75	.55
24	.98	.75	.92	1.2	1.25	2.45	1.36	3.3	.80	.68	.75	.62
25	.98	.82	.90	1.2	1.25	2.4	1.36	3.2	.88	.69	.71	.66
26	.94	.69	.90	1.2	1.3	2.4	1.31	3.0	.90	.68	.59	.72
27	.90	.56	.92	1.2	1.25	2.5	1.29	2.9	.89	.68	.68	.75
28	.90	.72	.95	1.2	1.25	1.85	1.31	3.0	.90	.66	.59	.80
29	.88	.90	.92	1.2	.....	1.8	1.31	3.0	.86	.66	.50	.70
30	.88	.78	.95	1.2	.....	1.75	1.28	2.95	.81	.88	.35	.72
31	.85	.....	.99	1.2	.....	1.65	.....	2.5	.....	.58	.45	.....

NOTE.—Discharge relation affected by ice about Dec. 8, 1912, to Mar. 14, 1913. On Mar. 22, 1913, observer reported slush ice below the gage.

CEDAR RIVER NEAR AUSTIN, MINN.

Location.—In sec. 15, T. 102 N., R. 18 W., just below the dam of the Red Cedar mill, 2 miles below Austin.

Records available.—May 29, 1909, to September 30, 1913.

Drainage area.—425 square miles.

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Gage.—Chain gage since May 2, 1913, read to quarter-tenths three times daily when Red Cedar mill (see "Regulation") is in operation and twice daily at other times. Limits of use: Hundredths below 3.0, half-tenths from 3.0 to 4.0, and tenths above 4.0 feet.

Winter flow.—The discharge relation was probably not materially affected by ice during the winter of 1912–13.

Regulation.—Immediately above the station is the power plant known as Red Cedar mill. During the low-water season the water is drawn down below the crest of the dam by the end of the 10 or 12 hour run, and after the turbine is closed the water is held back for several hours before it has risen sufficiently to flow over the crest. Consequently the stage of the river changes considerably during each 24 hours.

Accuracy.—Owing to the slightly shifting channel, the growth of vegetation, and fluctuations in stage caused by the operation of the power house records are only fair.

Discharge measurements of Cedar River near Austin, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 24	S. B. Soulé	2.51	[a]58.4	June 27	S. B. Soulé	4.90	766
Apr. 1	do	3.06	195	Sept. 25	B. J. Peterson	2.71	[c]57.2
May 21	do	4.67	[b]676	25	do	2.75	[c]67.7

[a] Velocities determined by subsurface method.
[b] Slight obstruction from barbed wires in river just below gage.
[c] Large amount of grass at control.

Daily gage height, in feet, of Cedar River near Austin, Minn., for the year ending Sept. 30, 1913.

[J. C. King, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	2.11	2.45	2.43	2.23	2.34	2.59	3.05	2.56	2.63	2.73	2.72	2.61
2	2.47	2.46	2.36	2.22	1.98	2.29	3.05	2.57	2.74	2.66	2.61	2.62
3	2.47	2.33	2.36	2.23	2.31	2.59	3.5	2.76	2.68	2.61	2.52	2.60
4	2.48	2.40	2.42	2.24	2.33	2.27	3.35	3.15	2.66	2.47	2.58	2.56
5	2.49	2.42	2.42	2.05	2.01	2.25	3.1	3.20	2.64	2.62	2.55	2.40
6	2.33	2.48	2.34	2.40	2.56	2.37	2.92	3.00	2.62	2.53	2.48	2.42
7	2.37	2.43	2.34	2.37	2.01	2.20	2.87	2.89	2.62	2.86	2.46	2.17
8	2.42	2.46	2.30	2.33	2.36	3.85	2.81	2.80	2.47	2.82	2.51	2.55
9	2.44	2.44	2.47	2.05	2.06	4.4	2.79	2.80	2.52	2.67	2.51	2.44
10	2.42	2.31	2.42	2.40	2.28	5.6	3.1	2.74	2.54	2.57	2.69	2.43
11	2.52	2.38	2.23	2.42	2.29	5.7	3.7	2.67	2.52	2.64	2.76	2.44
12	2.60	2.52	2.27	2.05	2.38	4.9	4.1	2.73	2.45	2.65	2.78	2.47
13	2.43	2.66	2.24	2.36	2.52	4.1	3.65	2.66	2.36	2.55	2.70	2.47
14	2.69	2.65	2.21	2.43	2.06	6.7	3.5	2.82	2.45	2.66	2.59	2.21
15	2.59	2.66	2.08	2.36	2.28	5.05	3.15	3.35	2.34	2.58	2.57	2.55
16	2.53	2.64	2.35	1.92	2.19	4.2	3.05	3.8	2.42	2.66	2.55	2.49
17	2.51	2.48	2.47	2.15	2.30	3.45	2.92	4.7	2.42	2.59	2.50	2.49
18	2.51	2.58	2.44	2.37	2.28	3.25	2.85	4.8	2.41	2.62	2.78	2.49
19	2.46	2.56	2.41	2.36	1.98	3.3	2.80	4.3	2.41	2.50	2.62	2.52
20	2.32	2.56	2.27	2.36	2.30	3.05	2.71	4.5	2.50	2.39	2.74	2.57
21	2.55	2.57	2.20	2.25	2.31	2.95	2.77	4.7	2.46	2.53	2.74	2.48
22	2.56	2.48	2.00	2.21	2.66	2.81	2.73	4.5	2.38	2.50	3.25	2.58
23	2.49	2.50	2.39	2.31	2.01	2.76	2.68	4.0	2.46	2.48	3.3	2.50
24	2.45	2.33	2.26	2.30	2.38	6.5	2.71	3.6	2.49	2.46	3.1	2.70
25	2.49	2.53	2.11	2.43	2.22	6.5	2.71	3.3	5.5	2.44	2.95	2.74
26	2.44	2.52	2.35	2.32	2.22	4.5	2.70	3.4	6.7	2.45	2.76	2.71
27	2.36	2.54	2.30	2.44	2.34	3.4	2.64	3.3	4.7	2.37	2.60	2.64
28	2.42	2.37	2.22	2.31	2.00	3.3	2.66	3.15	3.8	2.45	2.58	2.54
29	2.44	2.52	1.97	2.26	.....	3.4	2.62	3.1	3.15	2.54	2.52	2.70
30	2.42	2.58	2.25	2.38	.....	3.35	2.60	2.87	2.93	2.53	2.58	2.67
31	2.47	.....	2.37	2.27	.....	3.25	.....	2.87	.....	2.75	2.47	.....

NOTE.—Discharge relation probably not materially affected by ice during the year ending Sept. 30, 1913.

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Daily discharge, in second-feet, of Cedar River near Austin, Minn., for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	7.5	48	45	18	31	74	189	68	83	62	60	42
2	51	50	34	17	4	24	189	70	110	50	42	43
3	51	30	34	18	26	74	310	115	95	42	28	40
4	53	40	43	19	30	22	268	215	90	22	37	34
5	54	43	43	6	5	20	202	228	86	43	32	15
6	30	53	31	40	68	36	155	176	81	30	23	17
7	36	45	31	36	5	15	142	148	81	90	21	4
8	43	50	25	30	34	413	128	125	51	81	26	32
9	46	46	23	6	6	586	122	125	60	51	26	19
10	43	26	21	40	23	1,030	202	110	64	36	54	18
11	60	37	18	43	24	1,070	368	93	60	46	68	19
12	76	60	22	6	37	762	490	108	48	48	72	22
13	45	90	19	34	60	490	353	90	34	32	56	22
14	98	88	16	45	6	1,450	310	130	48	50	38	5
15	74	90	6.3	34	23	819	215	268	31	37	36	32
16	62	86	32	4	14	522	189	398	43	50	32	24
17	58	53	51	11	25	296	155	688	43	38	25	24
18	58	72	46	36	23	241	138	724	42	43	72	24
19	50	68	42	34	4	254	125	554	42	25	43	28
20	28	68	22	34	25	189	102	618	56	14	64	36
21	66	70	15	20	26	163	118	688	50	30	64	23
22	68	53	4.5	16	90	128	108	618	37	25	189	37
23	54	56	38	26	5	115	95	458	50	23	202	25
24	48	30	21	25	37	1,370	102	338	54	21	150	56
25	54	62	7.5	45	17	1,370	102	254	990	19	112	64
26	46	60	32	28	17	618	100	282	1,450	20	68	58
27	34	64	25	46	31	282	86	254	688	13	40	46
28	43	36	17	26	4	254	90	215	398	20	37	31
29	46	60	4.2	21	.....	282	81	202	215	31	28	56
30	43	72	20	37	.....	268	76	142	158	30	37	51
31	51	.....	36	22	.....	241	.....	142	.....	66	22	.....

NOTE.—Daily discharge Oct. 1, 1912, to June 30, 1913, computed from a rating curve well defined between 6.7 and 1,370 second-feet (gage heights 2.1 and 6.5 feet). Daily discharge July 1 to Sept. 30, 1913, computed from a rating curve based on the discharge measurements made on Sept. 25, 1913. The discharge relation was probably affected by backwater from grass during the latter period. Estimates of discharge for January and February may possibly be somewhat too high as the open-water rating curve was used during these months.

Monthly discharge of Cedar River near Austin, Minn., for the year ending Sept. 30, 1913.

[Drainage area, 425 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	98	7.5	50.9	0.120	0.14	B.
November	90	26	56.9	.134	.15	B.
December	51	4.2	26.6	.063	.07	C.
January	46	4	26.5	.062	.07	C.
February	90	4	25.0	.059	.06	D.
March	1,450	15	435	1.02	1.18	C.
April	490	76	177	.416	.46	B.
May	724	68	279	.656	.76	B.
June	1,450	31	178	.419	.47	C.
July	90	13	38.3	.090	.10	C.
August	202	21	58.2	.137	.16	C.
September	64	4	31.6	.074	.08	C.
The year	1,450	4	116	.273	3.70	

NOTE.—See footnote to table of daily discharge.

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CEDAR RIVER AT CEDAR RAPIDS, IOWA.

Location.—In the central part of Cedar Rapids, below the dam and between the electric railroad bridge and the Seventh Avenue combination railroad and foot bridge.

Records available.—October 26, 1902, to September 30, 1913.

Drainage area.—6,320 square miles.

Gage.—An inclined staff gage fastened to posts driven in the right bank of the river in the rear of the Iowa Windmill & Pump Co.'s plant. Gage read once daily, in the morning, to tenths.

Channel and control.—Bed of river consists of rock and gravel; clean of vegetation and nearly permanent.

Discharge measurements.—Made from upstream side of the First Avenue bridge.

Winter flow.—Discharge relation affected only slightly by ice, as the current is swift and ice seldom forms across the river for the entire width.

Regulation.—A dam and power plant above the station may modify the flow to some extent during low stages of the river.

Accuracy.—Records good.

Cooperation.—Gage heights furnished by United States Weather Bureau.

Discharge measurements of Cedar River at Cedar Rapids, Iowa, during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 8	S. B. Soulé	3.01	910	Sept. 3	B. J. Peterson	2.78	688
Sept. 3	B. J. Peterson	2.79	[a]733				

[a] Measurement made at Fourteenth Avenue bridge; not a good measuring section.

Daily gage height, in feet, of Cedar River at Cedar Rapids, Iowa, for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	3.1	3.1	3.0	3.1	3.0	2.8	4.7	3.6	5.0	4.0	2.8	2.9
2	3.2	3.0	2.9	2.9	3.0	3.0	4.6	3.7	4.6	3.8	2.9	2.7
3	3.1	3.1	3.1	2.9	2.9	2.9	4.2	3.5	4.5	3.8	2.8	2.8
4	3.2	3.0	2.8	2.8	3.0	3.0	4.3	3.7	4.3	3.5	2.9	2.7
5	3.1	3.0	2.9	2.9	2.9	2.9	4.3	3.6	4.2	3.6	2.8	2.8
6	3.2	2.9	2.7	2.7	3.0	3.1	4.2	4.2	4.0	3.4	2.9	2.7
7	3.1	3.2	2.8	2.8	2.8	3.0	4.2	4.0	4.1	3.5	2.8	2.8
8	3.2	3.0	2.8	2.7	2.9	3.1	4.3	4.1	3.9	3.3	2.9	2.7
9	3.2	3.1	2.9	2.8	2.7	3.9	4.2	4.1	3.9	3.4	2.8	2.8
10	3.5	2.9	3.0	2.9	2.8	4.0	4.4	4.1	3.7	3.3	3.0	2.7
11	3.4	3.0	3.1	3.1	2.7	4.1	4.5	3.9	3.8	3.4	2.9	2.9
12	3.4	2.9	3.0	3.0	2.8	4.3	4.6	3.9	3.7	3.3	2.9	2.8
13	3.3	3.1	3.1	3.2	2.8	6.5	5.0	3.8	3.7	3.4	3.0	2.9
14	3.3	3.2	3.2	3.1	2.9	6.7	5.0	4.0	3.6	3.3	3.1	2.8
15	3.2	3.4	2.8	3.2	2.8	7.5	4.7	4.2	4.6	3.4	3.0	2.9
16	3.3	3.2	2.7	3.4	3.0	7.6	4.6	4.3	3.7	3.0	3.0	2.7
17	3.1	3.2	2.8	3.7	2.9	7.7	4.4	4.3	3.8	3.1	2.9	2.9
18	3.2	3.0	2.8	3.7	3.0	8.9	4.4	4.3	3.6	3.0	3.0	2.7
19	3.1	3.1	2.9	3.6	2.9	8.7	4.3	4.2	3.7	3.1	2.8	2.8
20	3.2	3.0	2.8	3.2	3.3	7.6	4.3	4.9	3.6	3.0	2.9	2.7
21	3.1	3.1	2.9	3.2	3.2	6.8	4.0	5.0	3.6	3.0	2.8	2.8
22	3.1	2.9	2.8	3.1	3.1	6.7	4.1	5.5	3.6	3.0	2.9	2.7
23	3.0	3.0	2.9	3.1	3.0	6.2	4.0	5.6	3.6	3.1	2.8	2.8
24	3.1	2.9	2.7	3.0	3.0	6.4	4.0	5.9	3.4	3.0	2.9	2.7
25	3.1	2.9	2.8	3.0	2.9	6.9	3.9	5.8	3.5	3.1	2.9	2.8
26	3.2	2.8	2.7	2.9	3.0	6.3	3.9	6.0	3.4	2.9	2.9	2.7
27	3.1	2.9	2.9	3.0	2.9	6.3	3.8	5.7	3.5	3.0	2.8	2.8
28	3.2	2.9	2.8	2.9	2.9	6.5	3.9	5.7	3.5	2.9	2.9	2.7
29	3.1	3.0	3.0	3.1	.....	5.9	3.7	5.5	3.5	3.0	2.8	2.8
30	3.1	2.9	2.9	3.1	.....	5.6	3.8	5.4	3.4	2.9	2.9	2.8
31	3.0	.....	3.1	3.2	.....	5.2	.....	5.1	.....	3.0	2.8	.....

NOTE.—Discharge relation probably not materially affected by ice during the year ending Sept. 30, 1913.

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Daily discharge, in second-feet, of Cedar River at Cedar Rapids, Iowa, for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	1,100	1,100	950	1,100	950	690	5,430	2,070	6,470	3,170	690	810
2	1,260	950	810	810	950	950	5,090	2,320	5,090	2,590	810	580
3	1,100	1,100	1,100	810	810	810	3,790	1,840	4,760	2,590	690	690
4	1,260	950	690	690	950	950	4,110	2,320	4,110	1,840	810	580
5	1,100	950	810	810	810	810	4,110	2,070	3,790	2,070	690	690
6	1,260	810	580	580	950	1,100	3,790	3,790	3,170	1,630	810	580
7	1,100	1,260	690	690	690	950	3,790	3,170	3,480	1,840	690	690
8	1,260	950	690	580	810	1,100	4,110	3,480	2,870	1,440	810	580
9	1,260	1,100	810	690	580	2,870	3,790	3,480	2,870	1,630	690	690
10	1,840	810	950	810	690	3,170	4,430	3,480	2,320	1,440	950	580
11	1,630	950	1,100	1,100	580	3,480	4,760	2,870	2,590	1,630	810	810
12	1,630	810	950	950	690	4,110	5,090	2,870	2,320	1,440	810	690
13	1,440	1,100	1,100	1,260	690	12,000	6,470	2,590	2,320	1,630	950	810
14	1,440	1,260	1,260	1,100	810	12,700	6,470	3,170	2,070	1,440	1,100	690
15	1,260	1,630	690	1,260	690	15,800	5,430	3,790	5,090	1,630	950	810
16	1,440	1,260	580	1,630	950	16,200	5,090	4,110	2,320	950	950	580
17	1,100	1,260	690	2,320	810	16,600	4,430	4,110	2,590	1,100	810	810
18	1,260	950	690	2,320	950	21,400	4,430	4,110	2,070	950	950	580
19	1,100	1,100	810	2,070	810	20,600	4,110	3,790	2,320	1,100	690	690
20	1,260	950	690	1,260	1,440	16,200	4,110	6,120	2,070	950	810	580
21	1,100	1,100	810	1,260	1,260	13,100	3,170	6,470	2,070	950	690	690
22	1,100	810	690	1,100	1,100	12,700	3,480	8,250	2,070	950	810	580
23	950	950	810	1,100	950	10,800	3,170	8,610	2,070	1,100	690	690
24	1,100	810	580	950	950	11,600	3,170	9,710	1,630	950	810	580
25	1,100	810	690	950	810	13,500	2,870	9,340	1,840	1,100	810	690
26	1,260	690	580	810	950	11,200	2,870	10,100	1,630	810	810	580
27	1,100	810	810	950	810	11,200	2,590	8,970	1,840	950	690	690
28	1,260	810	690	810	810	12,000	2,870	8,970	1,840	810	810	580
29	1,100	950	950	1,100	.....	9,710	2,320	8,250	1,840	950	690	690
30	1,100	810	810	1,100	.....	8,610	2,590	7,890	1,630	810	810	690
31	950	.....	1,100	1,260	.....	7,170	.....	6,820	.....	950	690	.....

NOTE.—Daily discharge computed from a rating curve well defined between 600 and 36,000 second-feet. Open-channel rating table applied throughout entire year.

Daily gage height, in feet, of Cedar River at Cedar Rapids, Iowa, for the year ending Sept. 30, 1913.

[Drainage area, 6,320 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	1,840	950	1,230	0.195	0.22	A.
November	1,630	690	993	.157	.18	A.
December	1,260	580	812	.128	.15	B.
January	2,320	580	1,100	.174	.20	B.
February	1,440	580	866	.137	.14	B.
March	21,400	690	8,840	1.40	1.61	B.
April	6,470	2,320	4,060	.642	.72	A.
May	10,100	1,840	5,130	.812	.94	A.
June	6,470	1,630	2,770	.438	.49	A.
July	3,170	810	1,400	.222	.26	A.
August	1,100	690	799	.127	.15	A.
September	810	580	666	.105	.12	A.
The year	21,400	580	2,410	.381	5.18	

DES MOINES RIVER AT JACKSON, MINN.

Location.—At highway bridge half a mile below the dam at Jackson, Minn., 100 yards above the nearest tributary, a small stream entering from the west.

Records available.—May 31, 1909, to December 20, 1913, when station was discontinued.

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Drainage area.—1,160 square miles.

Gage.—Vertical staff, read morning and evening to quarter-tenths. Limits of use: Hundredths below 4.0, half-tenths from 4.0 to 5.0, and tenths above 5.0 feet.

Channel and control.—Sandy; shifts during high water.

Discharge measurements.—Made from the bridge or by wading.

Winter flow.—Discharge relation affected by ice; observations discontinued.

Regulation.—A power plant at the dam half a mile above the station develops 35 horsepower under a head of 6½ feet. The plant operates only 6 hours a day on average, but the morning and evening gage heights do not show any appreciable change in the stage of the river.

Discharge measurements of Des Moines River at Jackson, Minn., during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 2	S. B. Soulé	3.24	27.3	May 22	S. B. Soulé	5.07	[a]343
2	do	3.44	37.7	Sept. 26	B. J. Peterson	3.68	87.9

[a] Slight obstruction caused by a snag at control.

Daily gage height, in feet, of Des Moines River at Jackson, Minn., from Oct. 1, 1912, to Dec. 20, 1913.

[Mrs. Mary Strobel, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.80	2.78	3.00	.....	.....	.....	3.10	4.25	4.7	3.76	3.66	5.1	3.56	3.25	3.11
2	2.80	2.95	2.98	.....	.....	.....	3.29	4.0	4.65	4.05	3.69	5.1	3.55	3.26	3.05
3	2.78	2.95	2.89	.....	.....	.....	3.21	4.2	4.6	4.05	3.64	5.1	3.51	3.16	3.14
4	2.75	2.90	2.81	.....	.....	.....	3.22	4.15	4.5	4.1	3.61	5.0	3.48	3.06	3.18
5	2.76	2.91	2.80	.....	.....	.....	3.52	4.1	4.4	4.2	3.68	4.9	3.48	3.15	3.19
6	2.76	2.91	.....	.....	.....	.....	3.46	4.0	4.35	4.2	3.56	4.8	3.41	3.20	3.18
7	2.75	2.91	.....	.....	.....	.....	3.72	3.91	4.25	4.05	3.49	4.75	3.45	3.26	3.04
8	2.75	2.89	.....	.....	.....	.....	3.59	3.86	4.2	4.1	3.48	4.65	3.39	3.21	3.10
9	2.91	2.88	.....	.....	.....	.....	3.44	3.88	4.1	4.1	3.58	4.55	3.46	3.21	2.98
10	3.25	2.89	.....	.....	.....	.....	3.74	3.78	4.1	4.0	3.50	4.6	3.49	3.15	3.16
11	3.10	2.90	.....	.....	.....	.....	3.74	3.71	4.0	4.15	3.58	5.05	3.51	3.09	2.98
12	3.05	2.95	.....	.....	.....	.....	4.25	3.61	3.98	4.1	3.60	4.4	3.42	3.28	2.95
13	3.00	2.98	.....	.....	.....	.....	4.50	4.1	3.90	4.05	3.60	4.3	3.34	3.31	2.92
14	2.98	3.00	.....	.....	.....	.....	4.65	4.1	3.88	3.9	3.54	4.2	3.39	3.16	2.91
15	2.94	2.96	.....	.....	.....	.....	4.55	4.25	3.82	3.95	3.56	4.15	3.34	3.24	3.10
16	3.00	2.95	.....	.....	.....	.....	4.25	4.2	3.69	3.89	3.56	4.05	3.42	3.20	3.08
17	3.30	2.95	.....	.....	.....	.....	4.1	4.8	3.72	3.92	3.50	3.92	3.45	3.10	3.16
18	3.10	2.92	.....	.....	.....	.....	4.2	4.4	3.60	3.88	3.40	3.86	3.52	3.00	3.15
19	2.99	2.96	.....	.....	.....	.....	4.2	4.4	3.52	3.88	3.48	3.84	3.32	3.16	3.09
20	2.92	2.96	.....	.....	.....	.....	4.2	4.7	3.70	3.80	4.1	3.84	3.22	3.18	3.22
21	2.89	2.90	.....	.....	.....	.....	4.1	4.95	3.89	3.71	4.4	3.80	3.28	3.22	.....
22	2.85	2.90	.....	.....	.....	.....	4.05	5.0	3.76	3.81	4.35	3.66	3.30	3.22	.....
23	2.85	2.90	.....	.....	.....	.....	4.1	4.85	3.52	3.80	4.55	3.66	3.29	3.18	.....
24	2.82	2.96	.....	.....	.....	.....	4.5	4.75	3.55	3.74	4.65	3.70	3.28	3.09	.....
25	2.80	2.88	.....	.....	.....	.....	4.6	4.8	3.46	3.75	4.75	3.72	3.28	3.02	.....
26	2.81	3.00	.....	.....	.....	.....	4.6	4.95	3.89	3.74	4.8	3.68	3.28	3.18	.....
27	2.80	3.10	.....	.....	.....	.....	4.4	5.1	3.65	3.75	4.85	3.71	3.02	3.18	.....
28	2.80	3.00	.....	.....	.....	.....	4.25	5.0	3.62	3.64	4.9	3.60	3.21	3.10	.....
29	2.80	2.98	.....	.....	.....	.....	4.2	4.95	3.69	3.78	4.9	3.58	3.10	3.11	.....
30	2.79	2.98	.....	.....	.....	.....	4.1	4.85	3.58	3.71	5.0	3.62	3.26	3.18	.....
31	2.78	.....	.....	.....	.....	3.16	.....	4.75	.....	3.65	5.1	.....	3.22	.....	.....

NOTE.—Discharge relation affected by ice about Dec. 6, 1912, to Mar. 31, 1913.

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Daily discharge, in second-feet, of Des Moines River at Jackson, Minn., from Oct. 1, 1912, to Dec. 20, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.0	4.8	18	.....	.....	.....	9	170	268	100	86	354	73	37	23
2	5.0	14	16	.....	.....	.....	27	128	258	144	91	354	72	38	17
3	4.8	14	8.6	.....	.....	.....	19	161	248	144	84	354	67	28	26
4	4.5	9.0	5.4	.....	.....	.....	20	152	228	152	79	332	64	18	30
5	4.6	9.9	5.0	.....	.....	.....	53	144	208	170	89	310	64	27	31
6	4.6	9.9	.....	.....	.....	.....	46	128	198	170	73	288	55	32	30
7	4.5	9.9	.....	.....	.....	.....	77	116	179	144	65	278	60	38	16
8	4.5	8.6	.....	.....	.....	.....	61	109	170	152	64	258	53	33	22
9	9.9	8.2	.....	.....	.....	.....	44	112	152	152	76	238	61	33	10
10	48	8.6	.....	.....	.....	.....	81	98	152	136	66	248	65	27	28
11	30	9.0	.....	.....	.....	.....	81	89	136	161	76	343	67	21	10
12	24	14	.....	.....	.....	.....	157	76	133	152	78	208	56	40	8
13	18	16	.....	.....	.....	.....	208	147	120	144	78	188	47	43	6
14	16	18	.....	.....	.....	.....	238	147	117	120	71	170	53	28	5
15	13	14	.....	.....	.....	.....	218	179	109	128	73	161	47	36	22
16	18	14	.....	.....	.....	.....	161	170	91	119	73	144	56	32	20
17	54	14	.....	.....	.....	.....	136	288	95	123	66	123	60	22	28
18	30	11	.....	.....	.....	.....	152	208	78	117	54	114	68	12	27
19	17	14	.....	.....	.....	.....	152	208	68	117	64	112	44	28	21
20	11	14	.....	.....	.....	.....	152	268	92	106	152	112	34	30	34
21	8.6	9.0	.....	.....	.....	.....	136	321	119	93	208	106	40	34	.....
22	7.0	9.0	.....	.....	.....	.....	128	332	100	107	198	86	42	34	.....
23	7.0	9.0	.....	.....	.....	.....	136	299	68	106	238	86	41	30	.....
24	5.8	14	.....	.....	.....	.....	208	278	72	98	258	92	40	21	.....
25	5.0	8.2	.....	.....	.....	.....	228	288	61	99	278	95	40	14	.....
26	5.4	18	.....	.....	.....	.....	228	321	119	98	288	89	40	30	.....
27	5.0	30	.....	.....	.....	.....	198	354	85	99	299	93	14	30	.....
28	5.0	18	.....	.....	.....	.....	170	332	81	84	310	78	33	22	.....
29	5.0	16	.....	.....	.....	.....	161	321	91	103	310	76	22	23	.....
30	4.9	16	.....	.....	.....	.....	144	299	76	93	332	81	38	30	.....
31	4.8	.....	.....	.....	.....	.....	.....	278	.....	85	354	.....	34	.....	.....

NOTE.—Daily discharge determined as follows: Oct. 1 to Dec. 5, 1912, and May 22 to Dec. 20, 1913, from two fairly well-defined rating curves; Apr. 1 to May 21, 1913, by the indirect method for shifting channels.

Monthly discharge of Des Moines River at Jackson, Minn., Oct. 1, 1912, to Dec. 20, 1913.

[Drainage area, 1,160 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	54	4.5	12.6	0.011	0.01	C.
November	30	4.8	12.7	.011	.01	C.
April	238	9	128	.110	.12	C.
May	354	76	210	.181	.21	B.
June	268	61	132	.114	.13	B.
July	170	84	123	.106	.12	B.
August	354	54	149	.128	.15	B.
September	354	76	186	.160	.18	B.
October	73	14	50.0	.043	.05	B.
November	43	12	29.0	.025	.03	C.
December 1-20	34	5	20.7	.018	.01	D.

DES MOINES RIVER NEAR FORT DODGE, IOWA.

Location.—At the upper highway bridge, 1 mile upstream from Fort Dodge and just above the Illinois Central Railroad bridge.

Records available.—April 23, 1905, to July 19, 1906, for station at old Swede Town Bridge, about 1 mile farther downstream; August 4, 1911, to October 17, 1913, when station was discontinued, at upper highway bridge.

Drainage area.—Not measured.

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Gage.—Chain gage fastened to the outside handrail, downstream side of right span, read once daily to quarter-tenths. Limits of use: Hundredths below 2.0, half-tenths from 2.0 to 3.0, and tenths above 3.0 feet.

Channel and control.—Bed of river composed of sand and gravel; practically permanent.

Winter flow.—Observations discontinued during winter months.

Accuracy.—Heavy rains in the basin of Lizard Creek may cause backwater at the gage and affect the discharge relation. During October, 1913, a temporary dam was built below the station, causing backwater, and the station was abandoned in favor of a new one at Kalo, Iowa. Sufficient discharge measurements have not been made to develop the rating curve above 1,340 second-feet (gage height 3.0 feet) and estimates of discharge above that stage have therefore not been prepared.

Discharge measurements of Des Moines River near Fort Dodge, Iowa, during the period Oct. 1, 1912, to Oct. 17, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 6	S. B. Soulé	1.32	102	Sept. 5	B. J. Peterson	1.58	254
6	do	1.19	71.5	Oct. 14	S. B. Soulé	2.20	[a] 138
Sept. 5	B. J. Peterson	1.60	264				

[a] Backwater from dam built about 500 feet below gage during October, 1913.

NOTE.—Measurements made by wading.

Daily gage height, in feet, of Des Moines River near Fort Dodge, Iowa, from Oct. 1, 1912, to Oct. 17, 1913.

[O. C. Hanson, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	1.30	1.30	.....	.....	.....	.....	.....	2.9	4.8	1.80	1.30	1.50	1.72
2	1.30	1.40	.....	.....	.....	.....	.....	2.8	4.4	1.80	1.30	1.50	1.75
3	1.22	1.42	.....	.....	.....	.....	.....	2.85	4.1	1.82	1.28	1.52	1.80
4	1.30	1.40	.....	.....	.....	.....	.....	3.9	3.7	1.75	1.25	1.55	1.82
5	1.20	1.30	.....	.....	.....	.....	.....	4.6	3.3	1.78	1.30	1.60	1.85
6	1.30	1.22	.....	.....	.....	.....	.....	4.5	3.1	1.75	1.32	1.62	1.88
7	1.15	1.22	.....	.....	.....	.....	.....	4.4	3.0	1.72	1.32	1.65	1.90
8	1.25	1.20	.....	.....	.....	.....	.....	4.1	3.2	1.70	1.32	1.60	1.90
9	1.20	1.20	.....	.....	.....	.....	.....	4.0	3.3	1.70	1.32	1.60	1.92
10	1.20	1.22	.....	.....	.....	.....	.....	3.7	2.95	1.68	1.32	1.62	1.95
11	1.15	1.22	.....	.....	.....	.....	.....	3.5	2.7	1.70	1.35	1.65	1.95
12	1.50	1.25	.....	.....	.....	.....	.....	3.2	2.6	1.72	1.42	1.70	2.10
13	1.35	1.30	.....	.....	.....	.....	.....	3.3	2.4	1.68	1.48	1.70	2.15
14	1.40	1.35	.....	.....	.....	.....	.....	3.6	2.4	1.62	1.40	1.70	2.20
15	1.30	1.40	.....	.....	.....	.....	.....	6.8	2.25	1.60	1.40	1.68	2.20
16	1.40	1.42	.....	.....	.....	.....	.....	7.9	2.2	1.58	1.40	1.70	2.15
17	1.32	1.45	.....	.....	.....	.....	.....	5.6	2.1	1.55	1.38	1.70	2.22
18	1.40	1.42	.....	.....	.....	.....	.....	5.2	2.0	1.52	1.35	1.70	.....
19	1.40	1.40	.....	.....	.....	.....	.....	4.9	1.95	1.50	1.35	1.68	.....
20	1.42	1.40	.....	.....	.....	.....	.....	5.4	1.92	1.48	1.60	1.65	.....
21	1.30	1.40	.....	.....	.....	.....	.....	6.0	1.90	1.45	1.85	1.65	.....
22	1.42	1.42	.....	.....	.....	.....	.....	6.6	1.85	1.40	1.90	1.62	.....
23	1.30	1.40	.....	.....	.....	.....	.....	6.5	1.80	1.42	1.78	1.62	.....
24	1.40	.....	.....	.....	.....	.....	.....	6.4	1.78	1.45	1.70	1.60	.....
25	1.28	.....	.....	.....	.....	.....	.....	6.1	1.75	1.40	1.65	1.62	.....
26	1.30	.....	.....	.....	.....	.....	.....	6.0	1.78	1.40	1.62	1.65	.....
27	1.25	.....	.....	.....	.....	.....	.....	5.6	1.75	1.38	1.60	1.65	.....
28	1.38	.....	.....	.....	.....	.....	.....	5.4	1.70	1.35	1.55	1.60	.....
29	1.40	.....	.....	.....	.....	.....	.....	5.3	1.72	1.32	1.52	1.62	.....
30	1.40	.....	.....	.....	.....	.....	.....	5.2	1.75	1.32	1.50	1.65	.....
31	1.38	.....	.....	.....	.....	.....	.....	5.0	.....	1.32	1.55	.....	.....

NOTE.—Discharge relation probably affected during the greater part of October, 1913, by backwater from dam built about 500 feet below the gage. See "Accuracy" in station description.

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Daily discharge, in second-feet, of Des Moines River near Fort Dodge, Iowa, for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	106	106	.....	.....	.....	.....	.....	1,250	.....	395	106	200
2	106	148	.....	.....	.....	.....	.....	1,160	.....	395	106	200
3	80	158	.....	.....	.....	.....	.....	1,210	.....	409	100	212
4	106	148	.....	.....	.....	.....	.....	.....	.....	360	90	230
5	74	106	.....	.....	.....	.....	.....	.....	.....	381	106	260
6	106	80	.....	.....	.....	.....	.....	.....	.....	360	114	273
7	63	80	.....	.....	.....	.....	.....	.....	1,340	339	114	292
8	90	74	.....	.....	.....	.....	.....	.....	.....	325	114	260
9	74	74	.....	.....	.....	.....	.....	.....	.....	325	114	260
10	74	80	.....	.....	.....	.....	.....	.....	1,300	312	114	273
11	63	80	.....	.....	.....	.....	.....	.....	1,080	325	127	292
12	200	90	.....	.....	.....	.....	.....	.....	1,000	339	158	325
13	127	106	.....	.....	.....	.....	.....	.....	840	312	190	325
14	148	127	.....	.....	.....	.....	.....	.....	840	273	148	325
15	106	148	.....	.....	.....	.....	.....	.....	722	260	148	312
16	148	158	.....	.....	.....	.....	.....	.....	685	248	148	325
17	114	174	.....	.....	.....	.....	.....	.....	610	230	140	325
18	148	158	.....	.....	.....	.....	.....	.....	535	212	127	325
19	148	148	.....	.....	.....	.....	.....	.....	500	200	127	312
20	158	148	.....	.....	.....	.....	.....	.....	479	190	260	292
21	106	148	.....	.....	.....	.....	.....	.....	465	174	430	292
22	158	158	.....	.....	.....	.....	.....	.....	430	148	465	273
23	106	148	.....	.....	.....	.....	.....	.....	395	158	381	273
24	148	.....	.....	.....	.....	.....	.....	.....	381	174	325	260
25	100	.....	.....	.....	.....	.....	.....	.....	360	148	292	273
26	106	.....	.....	.....	.....	.....	.....	.....	381	148	273	292
27	90	.....	.....	.....	.....	.....	.....	.....	360	140	260	292
28	140	.....	.....	.....	.....	.....	.....	.....	325	127	230	260
29	148	.....	.....	.....	.....	.....	.....	.....	339	114	212	273
30	148	.....	.....	.....	.....	.....	.....	.....	360	114	200	292
31	140	.....	.....	.....	.....	.....	.....	.....	.....	114	230	.....

NOTE.—Daily discharge computed from a rating curve well defined between 40 and 1,340 second-feet (gage heights 1.0 and 3.0 feet).

See "Accuracy" in station description. Estimates of daily discharge, Oct. 1 to Nov. 23, 1912, differ from those published in Water Supply Paper No. 325 on account of revising the rating curve on basis of additional information obtained during 1913. Estimates prior to Oct. 1, 1912, should be revised by persons using them if thought desirable.

Monthly discharge of Des Moines River near Fort Dodge, Iowa, for the year ending Sept. 30, 1913.

Month.	Discharge in second-feet.			Accuracy.
	Maximum.	Minimum.	Mean.	
October	200	63	117	B.
November 1-23	174	74	124	B.
July	409	114	250	B.
August	465	90	192	B.
September	325	200	280	B.

NOTE.—Estimates of monthly discharge for October and November differ from those published in Water-Supply Paper 325 on account of a revision of the rating curve. See "Accuracy in station descritpion."

DES MOINES RIVER AT KEOSAUQUA, IOWA.

Location.—At county bridge one-fourth mile above old dam site and Government locks.

Records available.—May 30, 1903, to July 21, 1906; April 5 to September 30, 1910 (United States Engineer Corps); August 3, 1911, to September 30, 1913.

Drainage area.—14,300 square miles.

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Gage.—Chain gage attached to upstream side of bridge; read once daily to half-tenths. Limits of use: Half-tenths below and tenths above 2.0 feet. Gage was originally attached to downstream side of bridge; changed because of repairs to bridge at unknown date.

Channel and control.—Control a gravel riffle about one-fourth mile below gage; channel composed of sand and gravel on the left and rock on the right; shifts at flood stages.

Discharge measurements.—Made from downstream side of the bridge.

Winter flow.—Observations discontinued during winter months.

Discharge measurements of Des Moines River at Keosauqua, Iowa, during the year ending Sept. 30, 1913.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 11	S. B. Soulé	0.90	1,340	July 11	Bolster and Egbert	0.94	1,580
13	do	.93	1,370				

Daily gage height, in feet, of Des Moines River at Keosauqua, Iowa, for the year ending Sept. 30, 1913.

[Oscar McCrary, observer.]

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	0.6	1.2	0.75						5.8	2.4	0.55	0.45
2	.6	1.05	.8						5.5	2.6	.5	.4
3	.6	1.05	.85						5.6	1.5	.5	.4
4	.65	1.0	.9						5.0	1.35	.45	.35
5	.65	1.0	.9						4.6	1.3	.4	.35
6		1.0	.9						4.1	1.25	.4	.35
7		1.0	.85						3.9	1.2	.4	.35
8		.95	.8						3.5	1.15	.35	.3
9		1.0	.7						3.2	1.05	.35	.3
10		.8	.7						3.1	.95	.35	.3
11		.9	.7					4.4	2.7	.95	.55	.4
12		.95	.7					4.2	2.6	.9	.55	.7
13	2.9	.9						4.2	2.4	.85	.65	.4
14	3.3	.95						4.6	2.4	.8	.7	.4
15	3.1	1.25						6.8	2.0	.8	.9	.35
16	2.8	1.3						8.1	2.0	.8	.9	.35
17	2.6	1.25						4.5	1.75	.75	.85	.35
18	2.35	1.2						8.8	1.75	.75	1.35	.4
19	2.0	1.05						9.1	1.55	.7	1.25	.4
20	2.0	1.05						8.8	1.55	.7	.9	.8
21	1.8	1.05						9.2	1.35	.7	.9	.45
22	1.75	1.0						9.8	3.2	.7	.85	.4
23	1.75	1.0						9.0	2.7	.7	.8	.4
24	1.6	.95						9.0	3.0	.65	.75	.4
25	1.5	.9						9.0	3.0	.65	.7	.4
26	1.45	.95						9.1	5.6	.65	.6	.35
27	1.4	.9						8.8	5.3	.65	.6	.35
28	1.5	.85						8.4	4.7	.6	.6	.35
29	1.45	.8						7.6	4.1	.6	.55	.35
30	1.4	.75						7.0	3.6	.55	.5	.4
31	1.35							6.3		.55	.45	

NOTE.—Discharge relation affected by ice about Dec. 9–12, 1912.

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Daily discharge, in second-feet, of Des Moines River at Keosauqua, Iowa, for the year ending Sept. 30, 1913.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	860	1,810	1,080	.....	.....	.....	.....	.....	13,700	4,570	980	845
2	860	1,560	1,150	.....	.....	.....	.....	.....	12,800	5,060	910	780
3	860	1,560	1,230	.....	.....	.....	.....	.....	13,100	2,570	910	780
4	930	1,470	1,310	.....	.....	.....	.....	.....	11,500	2,280	845	715
5	930	1,470	1,310	.....	.....	.....	.....	.....	10,400	2,180	780	715
6	.....	1,470	1,310	.....	.....	.....	.....	.....	9,060	2,090	780	715
7	.....	1,470	1,230	.....	.....	.....	.....	.....	8,520	2,000	780	715
8	.....	1,390	1,150	.....	.....	.....	.....	.....	7,440	1,910	715	650
9	.....	1,470	.....	.....	.....	.....	.....	.....	6,630	1,740	715	650
10	.....	1,150	.....	.....	.....	.....	.....	.....	6,360	1,570	715	650
11	.....	1,310	.....	.....	.....	.....	.....	9,870	5,310	1,570	980	780
12	.....	1,390	.....	.....	.....	.....	.....	9,330	5,060	1,490	980	1,190
13	5,770	1,310	.....	.....	.....	.....	.....	9,330	4,570	1,420	1,120	780
14	6,880	1,390	.....	.....	.....	.....	.....	10,400	4,570	1,340	1,190	780
15	6,320	1,900	.....	.....	.....	.....	.....	16,500	3,630	1,340	1,490	715
16	5,500	1,990	.....	.....	.....	.....	.....	20,300	3,630	1,340	1,490	715
17	4,970	1,900	.....	.....	.....	.....	.....	10,100	3,080	1,260	1,420	715
18	4,320	1,810	.....	.....	.....	.....	.....	22,500	3,080	1,260	2,280	780
19	3,460	1,560	.....	.....	.....	.....	.....	23,400	2,670	1,190	2,090	780
20	3,460	1,560	.....	.....	.....	.....	.....	22,500	2,670	1,190	1,490	910
21	3,010	1,560	.....	.....	.....	.....	.....	23,700	2,280	1,190	1,490	845
22	2,900	1,470	.....	.....	.....	.....	.....	23,700	6,630	1,190	1,420	780
23	2,900	1,470	.....	.....	.....	.....	.....	23,100	5,310	1,190	1,340	780
24	2,580	1,390	.....	.....	.....	.....	.....	23,100	6,090	1,120	1,260	780
25	2,380	1,310	.....	.....	.....	.....	.....	23,100	6,090	1,120	1,190	780
26	2,280	1,390	.....	.....	.....	.....	.....	23,400	13,100	1,120	1,050	715
27	2,180	1,310	.....	.....	.....	.....	.....	22,500	12,300	1,120	1,050	715
28	2,380	1,230	.....	.....	.....	.....	.....	21,200	10,700	1,050	1,050	715
29	2,280	1,150	.....	.....	.....	.....	.....	18,800	9,060	1,050	980	715
30	2,180	1,080	.....	.....	.....	.....	.....	17,100	7,710	980	910	780
31	2,080	.....	.....	.....	.....	.....	.....	15,100	.....	980	845	.....

NOTE.—Daily discharge computed from two fairly well defined rating curves. New rating curve used beginning May 11, 1913.

Monthly discharge of Des Moines River at Keosauqua, Iowa, for the year ending Sept. 30, 1913.

[Drainage area, 14,300 square miles.]

Month.	Discharge in second-feet.				Run-off (depth in inches on drainage area).	Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.		
October	6,880	860	2,600	0.182	0.21	B.
November	1,990	1,080	1,480	.103	.11	B.
December 1–8	1,310	1,080	1,220	.085	.03	C.
May 11–31	23,700	9,330	18,500	1.29	1.01	B.
June	13,700	2,280	7,240	.506	.56	B.
July	5,060	980	1,660	.116	.13	B.
August	2,280	715	1,140	.080	.09	B.
September	1,190	650	766	.054	.06	B.

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MISCELLANEOUS MEASUREMENTS.

Miscellaneous flood stages for gaging stations in the upper Mississippi River basin during the flood of March-April, 1913.

Stream.	Date.	Gage height.
		Feet.
Sangamon River near Monticello, Ill	Mar. 25	17.7
Kaskaskia River near Arcola, Ill	Mar. 23	15.4
Do	Mar. 24	18.0
Do	Mar. 25	20.1
Kaskaskia River at Shelbyville, Ill	Mar. 17	17.9
Do	Mar. 18	18.3
Do	Mar. 19	18.9
Do	Mar. 20	19.0
Do	Mar. 21	19.4
Do	Mar. 22	19.3
Do	Mar. 23	18.7
Do	Apr. 1	16.8
Do	Apr. 2	16.5
Do	Apr. 3	16.9
Do	Apr. 4	16.5
Do	Apr. 5	16.5
Do	Apr. 6	14.5
Do	Apr. 7	13.3
Kaskaskia River at Vandalia, Ill	Mar. 29	[a] 21.7
Do	...do...	[b] 19.2
Kaskaskia River at New Athens, Ill	Mar. 30	[c] 32.9
Shoal Creek near Breese, Ill	Mar. 25	9.4
Do	Mar. 26	14.2
Do	Mar. 27	18.7
Do	Mar. 28	21.8
Do	Mar. 29	[d] 23.2
Do	...do...	[e] 22.7
Silver Creek near Lebanon, Ill	Mar. 27	*f* 18.5

[a] 4 a. m.
[b] 8 a. m.; breaking of levee caused the change in stage.
[c] Crest stage.
[d] 6.30 a. m.
[e] 4.30 p. m.
f Observer unable to reach gage to obtain crest stage.

Miscellaneous measurements in Hudson Bay drainage basin during the year ending Sept. 30, 1913.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
Aug. 21	Boulder Creek	Swiftcurrent Creek	Mouth		36
Jan. 16	Big Fork River	Rainy River	Big Falls, Minn	2.34	[a] 27.6

[a] Complete ice cover at gage; about 25 per cent ice cover at measuring section 700 feet above gage.

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Miscellaneous discharge measurements in upper Mississippi River drainage basin during the year ending Sept. 30, 1918.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
July 17	Redwood River.....	Minnesota River...	Just below power plant at Redwood Falls, Minn.	.....	19
18	.....do.....	.....do.....	200 feet below the single-span steel highway bridge at North Redwood, Minn.	.....	17.5
Sept. 18	.....do.....	.....do.....	One-half mile below power plant at Redwood Falls, Minn.	.....	1.2
18	Tail race of power plant at Redwood Falls.	Redwood River...	Redwood Falls, Minn.....	.....	.8
Aug. 6	Upper Iowa River....	Mississippi River..	Upper Iowa Power Co.'s power plant near Decorah, Iowa.	.....	171
6	.....do.....	.....do.....	.....do.....	.....	[a] 17.4
8	Volga River.....	Turkey River.....	300 feet above mouth at Elkport, Iowa.	.....	48.5
29	.....do.....	.....do.....	Elkport, Iowa, below highway bridge.	19.30	50
8	Elk Creek.....	.....do.....	Mouth, near Elkport, Iowa..	.....	8.2
29	.....do.....	.....do.....	.....do.....	.....	5.1
20	North Branch of Maquoketa River.	Maquoketa River..	Highway bridge three-fourths mile southwest of Fulton, Iowa.	[b] 21.79	304
20	Maquoketa River.....	.....do.....	Moorehead bridge at Iron Hill near Fulton, Iowa.	[b c] 23.02	202

[a] Represents leakage through tainter gates, wheels, and fishway.
[b] Distance from reference point to water surface.
[c] This measurement corresponds to a gage height of 2.25 feet at Goddard bridge about 2 miles downstream. Gage height at Goddard bridge was observed about one-half hour after measurement; stage falling rapidly.

NOTE.—All measurements, except those of Aug. 20, made by wading.

91388°—WSP 355—15——12

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WATER-SUPPLY PAPER 356

SURFACE WATER SUPPLY OF THE UNITED STATES

1913

PART VI. MISSOURI RIVER BASIN

N. C. GROVER, Chief Hydraulic Engineer
W. A. LAMB and ROBERT FOLLANSBEE, District Engineers

Prepared in cooperation with the States of Montana and Nebraska

WASHINGTON
GOVERNMENT PRINTING OFFICE
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SURFACE WATER SUPPLY OF MISSOURI RIVER BASIN, 1913.

AUTHORIZATION AND SCOPE OF WORK.

This volume is one of a series of twelve reports presenting results of measurements of flow made on streams in the United States during 1913. Six of the reports for 1913 contain data for the year ending September 30 and the other six for the calendar year, as indicated in the table on page 8.

The data presented in these reports were collected by the United States Geological Survey under authority implied in the organic law (20 Stat. L., p. 394) which contains the following paragraph:

Provided, That this officer [the Director] shall have the direction of the geological survey and the classification of public lands and examination of the geological structure, mineral resources, and products of the national domain.

The work was begun in 1888 in connection with special studies of water supply for irrigation. Since the fiscal year ending June 30, 1895, successive sundry civil bills passed by Congress have carried the following item and appropriations:

For gaging the streams and determining the water supply of the United States, and for the investigation of underground currents and artesian wells, and for the preparation of reports upon the best methods of utilizing the water resources.

Annual appropriations for the fiscal years ending June 30, 1895–1914.

1895	$12,500
1896	20,000
1897 to 1900, inclusive	50,000
1901 to 1902, inclusive	100,000
1903 to 1906, inclusive	200,000
1907	150,000
1908 to 1910, inclusive	100,000
1911 to 1914, inclusive	150,000

In the execution of the work many private and State organizations have cooperated, either by furnishing data or by assisting in collecting data. Acknowledgments for cooperation of the first kind are made in connection with the description of each station affected, and of the second kind on page 17.

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Measurements of stream flow have been made at about 3,000 points in the United States and also at many points in small areas in Seward Peninsula and the Yukon-Tanana region, Alaska, and in the Hawaiian Islands. In July, 1913, about 13,880 gaging stations were being maintained by the Survey and the cooperating organizations in the United States. Many miscellaneous discharge measurements are made at other points. In connection with this work data were also collected in regard to precipitation, evaporation, storage reservoirs, river profiles, and water power in many sections of the country and will be made available in the regular water supply papers from time to time.

PUBLICATIONS.

A report has been prepared for each year embodying the stream-flow data collected during that year. An index to the reports containing stream-flow measurements prior to 1904 has been published as Water-Supply Paper 119. Circulars are also available giving complete lists of the gaging stations maintained by the Survey to date, and a list of the reports relating to the water supply of the country.

Prior to 1901 gage heights and discharge measurements were published in water-supply papers or bulletins and estimates of monthly discharge in annual reports; since 1901 both classes of data have been published in water-supply papers and they are now being published in twelve parts, as shown in the following table:

Papers on surface water supply of the United States, 1913.

Part.	No.	Title.	Year used.
I	351	North Atlantic drainage basins	Calendar year.
II	352	South Atlantic and eastern Gulf of Mexico drainage basins	Do.
III	353	Ohio River basin	Year ending Sept. 30.
IV	354	St. Lawrence River basin	Calendar year.
V	355	Upper Mississippi River and Hudson Bay basins	Year ending Sept. 30.
VI	356	Missouri River basin	Calendar year.
VII	357	Lower Mississippi River basin	Do.
VIII	358	Western Gulf of Mexico basins	Year ending Sept. 30.
IX	359	Colorado River basin	Calendar year.
X	360	Great Basin	Year ending Sept. 30.
XI	361	Pacific drainage basins in California	Do.
XII	362	North Pacific drainage basins	Do.

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A list of reports containing stream-flow data is presented in the following table:

Stream-flow data in reports of the United States Geological Survey.

[A—Annual Report; B—Bulletin; WS—Water-Supply Paper.]

Report.	Character of data.	Year.
10th A, pt. 2	Description information only	
11th A, pt. 2	Monthly discharge	1884 to Sept., 1890.
12th A, pt. 2	do	1884 to June 30, 1891.
13th A, pt. 3	Mean discharge in second-feet	1884 to Dec. 31, 1892.
14th A, pt. 2	Monthly discharge (long-time records, 1871 to 1893)	1888 to Dec. 31, 1893.
B 131	Descriptions, measurements, gage heights, and ratings	1893 and 1894.
16th A, pt. 2	Descriptive information only	
B 140	Descriptions, measurements, gage heights, ratings, and monthly discharge (also many data covering earlier years).	1895.
WS 11	Gage heights (also gage heights for earlier years)	1896.
18th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also similar data for some earlier years).	1895 and 1896.
WS 15	Descriptions, measurements, and gage heights, eastern United States, eastern Mississippi River, and Missouri River above junction with Kansas.	1897.
WS 16	Descriptions, measurements, and gage heights, western Mississippi River below junction of Missouri and Platte, and western United States.	1897.
19th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also some long-time records).	1897.
WS 27	Measurements, ratings, and gage heights, eastern United States, eastern Mississippi River, and Missouri River.	1898.
WS 28	Measurements, ratings, and gage heights, Arkansas River and western United States.	1898.
20th A, pt. 4	Monthly discharge (also for many earlier years)	1898.
WS 35 to 39	Descriptions, measurements, gage heights, and ratings	1899.
21st A, pt. 4	Monthly discharge	1899.
WS 47 to 52	Descriptions, measurements, gage heights, and ratings	1900.
22d A, pt. 4	Monthly discharge	1900.
WS 65, 66	Descriptions, measurements, gage heights, and ratings	1901.
WS 75	Monthly discharge	1901.
WS 82 to 85	Complete data	1902.
WS 97 to 100	do	1903.
WS 124 to 135	do	1904.
WS 165 to 178	do	1905.
WS 201 to 214	do	1906.
WS 241 to 252	do	1907–8.
WS 261 to 272	do	1909.
WS 281 to 292	do	1910.
WS 301 to 312	do	1911.
WS 321 to 332	do	1912.
WS 351 to 362	do	1913.

NOTE.—No data regarding stream flow are given in the 15th and 17th annual reports.

The following table gives, by years and drainage basins, the numbers of the papers on surface-water supply published from 1899 to 1913. The data for any particular station will be found in the reports covering the years during which the station was maintained. For example, data for any station in the area covered by Part I are published in Water-Supply Papers 97, 124, 165, 201, 241, 261, 281, 301, 321, and 351, which contain records for the New England streams from 1903 to 1913. The year covered by the report is indicated at the head of the column in which the paper is listed.

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Numbers of water-supply papers containing results of stream measurements, 1899–1913.

	1899 [a]	1900 [b]	1901	1902	1903	1904	1905	1906	1907–8	1909	1910	1911	1912	1913
North Atlantic coast (St. John River to York River)	35	47, [c] 48	65, 75	82	97	[d] 124, [e] 125, [f] 126	[d] 165, [e] 166, [f] 167	[d] 201, [e] 202, [f] 203	241	261	281	301	321	351
South Atlantic coast and eastern Gulf of Mexico (James River to the Mississippi)	[g] 35, 36	48	65, 75	[g] 82, 83	[g] 97, 98	[f] 126, 127	[f] 167, 168	[f] 203, 204	242	262	282	302	322	352
Ohio River basin	36	48, [h] 49	65, 75	83	98	128	169	205	243	263	283	303	323	353
St. Lawrence River and Great Lakes	36	49	65, 75	[i] 82, 83	97	129	170	206	244	264	284	304	324	354
Hudson Bay and upper Mississippi River	36	49	[j] 65, 66, 75	[j] 83, 85	[j] 98, 99, 100	[j] 128, 130	171	207	245	265	285	305	325	355
Missouri River	[l] 36, 37	49, [m] 50	66, 75	84	[k] 99	130, [n] 131	172	208	246	266	286	306	326	356
Lower Mississippi River	37	50	[j] 65, 66, 75	[j] 83, 84	[j] 98, 99	[j] 128, 131	[j] 169, 173	[j] 205, 209	247	267	287	307	327	357
Western Gulf of Mexico	37	50	66, 75	84	99	132	174	210	248	268	288	308	328	358
Colorado River	[o] 37, 38	50	66, 75	85	100	133	175, [p] 177	211	249	269	289	309	329	359
Great Basin	38, [q] 39	51	66, 75	85	100	133, [r] 134	176, [r] 177	212, [r] 213	250, [r] 251	270, [r] 271	290	310	330	360
Pacific coast in California	38, [s] 39	51	66, 75	85	100	134	177	213	251	271	291	311	331	361
North Pacific coast	38	51	66, 75	85	100	135	[t] 177, 178	214	252	272	292	312	[u] 332	[u] 362

[a] Rating tables and index to Water-Supply Papers 35–39 contained in Water-Supply Paper 39. Estimates for 1899 in Twenty-first Annual Report, part 4.
[b] Rating tables and index to Water-Supply Papers 47–52 and data on precipitation, wells, and irrigation in California and Utah contained in Water-Supply Paper 52. Estimates for 1900 in Twenty-second Annual Report, part 4.
[c] Wissahickon and Schuylkill rivers to James River.
[d] New England rivers only.
[e] Hudson River to Delaware River, inclusive.
[f] Susquehanna River to Yadkin River, inclusive.
[g] James River only.
[h] Scioto River.
[i] Lake Ontario and tributaries to St. Lawrence River proper.
[j] Tributaries of Mississippi from east.
[k] Hudson Bay only.
[l] Gallatin River.
[m] Loup and Platte rivers near Columbus, Nebr., and all tributaries below junction with Platte.
[n] Platte and Kansas rivers.
[o] Green and Gunnison rivers and Grand River above junction with Gunnison.
[p] Below junction with Gila.
[q] Mohave River only.
[r] Great Basin in California, except Truckee and Carson drainage basins.
[s] King and Kern rivers and south Pacific coast drainage basin.
[t] Rogue, Umpqua, and Siletz rivers only.
[u] In three parts: *A*, Pacific drainage basins in Washington and upper Columbia River basin; *B*, Snake River basin; *C*, Lower Columbia River and Rogue, Umpqua, and Siletz river basins.

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Water-supply papers and other publications of the United States Geological Survey containing data in regard to the water resources of the United States may be obtained or consulted as indicated below:

1. Copies may be obtained free of charge by applying to the Director of the Geological Survey, Washington, D. C. The edition printed for free distribution is, however, small and is soon exhausted.

2. Copies may be purchased at nominal cost from the Superintendent of Documents, Government Printing Office, Washington, D. C., who will on application furnish lists giving prices.

3. Sets of the reports may be consulted in the libraries of the principal cities in the United States.

4. Complete sets are available for consultation in the local offices of the water-resources branch of the Geological Survey as follows:

Albany, N. Y., room 18, Federal Building.
Atlanta, Ga., Post Office Building.
St. Paul, Minn., Old Capitol Building.
Madison, Wis., Capitol Building.
Helena, Mont., Montana National Bank Building.
Denver, Colo., 302 Chamber of Commerce Building.
Salt Lake City, Utah, 421 Federal Building.
Pheonix, Ariz., 417 Fleming Building.
Boise, Idaho, 615 Idaho Building.
Portland, Oreg., 416 Couch Building.
Tacoma, Wash., Federal Building.
San Francisco, Cal., 328 Customhouse.
Los Angeles, Cal., Federal Building.
Santa Fe., N. Mex., Capitol Building.
Honolulu, Hawaii, Kapiolani Building.

A list of the Geological Survey's publications will be sent on application to the Director of the United States Geological Survey, Washington, D. C.

DEFINITION OF TERMS.

The volume of water flowing in a stream—the "run-off" or "discharge"—is expressed in various terms, each of which has become associated with a certain class of work. These terms may be divided into two groups—(1) those which represent a rate of flow, as second-feet, gallons per minute, miner's inches, and discharge in second-feet per square mile, and (2) those which represent the actual quantity of water, as run-off in depth in inches, acre-feet, and millions of cubic feet. The units used in this series of reports are second-foot, second-feet per square mile, run-off in inches, acre-foot, and millions of cubic feet. They may be defined as follows:

"Second-foot" is an abbreviation for "cubic foot per second" and is a unit for the rate of discharge of water flowing in a stream. A second-foot is the rate of discharge of water flowing in a channel of rectangular cross-section 1 foot wide and 1 foot deep at an average

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velocity of 1 foot per second. It is generally used as a fundamental unit from which others are computed by the use of the factors given in the tables of convenient equivalents (pp. 12–14).

"Second-feet per square mile" is the average number of cubic feet of water flowing per second from each square mile of area drained, on the assumption that the run-off is distributed uniformly both as regards time and area.

"Run-off, depth in inches," is the depth to which the drainage area would be covered if all the water flowing from it in a given period were conserved and uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

An "acre-foot" is equivalent to 43,560 cubic feet and is the quantity required to cover an acre to the depth of 1 foot. The term is commonly used in connection with storage for irrigation.

"Millions of cubic-feet" is a unit used to express quantities of water stored in reservoirs, and is most frequently used in studies of flood control.

The following terms used in these reports are not in common use:

"Discharge relation" is an abbreviation for the term "relation of gage height to discharge."

"Control," "controlling section," and "point of control," are terms used to designate the section or sections of the stream below the gage which determines the discharge relation at the gage. It should be noted that the control may not be the same section at all stages.

The "point of zero flow" for a given gaging station is that point on the gage—the gage height—to which the surface of the river would fall if there were no flow.

CONVENIENT EQUIVALENTS.

The following is a list of convenient equivalents for use in hydraulic computations:

Table for converting discharge in second-feet per square mile into run-off in depth in inches over the area.

Discharge in second-feet per square mile.	Run-off in inches.				
	1 day.	28 days.	29 days.	30 days.	31 days.
1.....	0.03719	1.041	1.079	1.116	1.153
2.....	.07438	2.083	2.157	2.231	2.306
3.....	.11157	3.124	3.236	3.347	3.459
4.....	.14876	4.165	4.314	4.463	4.612
5.....	.18595	5.207	5.393	5.578	5.764
6.....	.22314	6.248	6.471	6.694	6.917
7.....	.26033	7.289	7.550	7.810	8.070
8.....	.29752	8.331	8.628	8.926	9.223
9.....	.33471	9.372	9.707	10.041	10.376

NOTE.—For part of a month multiply the values for one day by the number of days.

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Table for converting discharge in second-feet into run-off in acre-feet.

Discharge in second-feet.	Run-off in acre-feet.				
	1 day.	28 days.	29 days.	30 days.	31 days.
1	1.983	55.54	57.52	59.50	61.49
2	3.967	111.1	115.0	119.0	123.0
3	5.950	166.6	172.6	178.5	184.5
4	7.934	222.1	230.1	238.0	246.0
5	9.917	277.7	287.6	297.5	307.4
6	11.90	333.2	345.1	357.0	368.9
7	13.88	388.8	402.6	416.5	430.4
8	15.87	444.3	460.2	476.0	491.9
9	17.85	499.8	517.7	535.5	553.4

NOTE.—For part of a month multiply values for one day by the number of days.

Table for converting discharge in second-feet into run-off in millions of cubic feet.

Discharge in second-feet.	Run-off in millions of cubic feet.				
	1 day.	28 days.	29 days.	30 days.	31 days.
1	0.0864	2.419	2.506	2.592	2.678
2	.1728	4.838	5.012	5.184	5.356
3	.2592	7.257	7.518	7.776	8.034
4	.3456	9.676	10.024	10.368	10.712
5	.4320	12.095	12.530	12.960	13.390
6	.5184	15.514	15.036	15.552	16.068
7	.6048	16.933	17.542	18.144	18.746
8	.6912	19.352	20.048	20.736	21.424
9	.7776	21.771	22.554	23.328	24.102

NOTE.—For part of a month multiply values for one day by the number of days.

1 second-foot equals 40 California miner's inches (law of Mar. 23, 1901).

1 second-foot equals 38.4 Colorado miner's inches.

1 second-foot equals 40 Arizona miner's inches.

1 second-foot equals 7.48 United States gallons per second; equals 448.8 gallons per minute; equals 646,317 gallons for one day.

1 second-foot for one year covers 1 square mile 1.131 feet or 13.572 inches deep.

1 second-foot for one year equals 31,536,000 cubic feet.

1 second-foot equals about 1 acre-inch per hour.

1 second-foot for one day equals 86,400 cubic feet.

1,000,000,000 (1 United States billion) cubic feet equals 11,570 second-feet for one day.

1,000,000,000 cubic feet equals 414 second-feet for one 28-day month.

1,000,000,000 cubic feet equals 399 second-feet for one 29-day month.

1,000,000,000 cubic feet equals 386 second-feet for one 30-day month.

1,000,000,000 cubic feet equals 373 second-feet for one 31-day month.

100 California miner's inches equals 18.7 United States gallons per second.

100 California miner's inches for one day equals 4.96 acre-feet.

100 Colorado miner's inches equals 2.60 second-feet.

100 Colorado miner's inches equals 19.5 Unlted States gallons per second.

100 Colorado miner's inches for one day equals 5.17 acre-feet.

100 United States gallons per minute equals 0.223 second-feet.

100 United States gallons per minute for one day equals 0.442 acre-feet.

1,000,000 United States gallons per day equals 1.55 second-feet.

1,000,000 United States gallons equals 3.07 acre-feet.

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1,000,000 cubic feet equals 22.95 acre-feet.
1 acre-foot equals 325,850 gallons.
1 inch deep on 1 square mile equals 2,323,200 cubic feet.
1 inch deep on 1 square mile equals 0.0737 second-foot per year.
1 foot equals 0.3048 meter.
1 mile equals 1.60935 kilometers.
1 mile equals 5,280 feet.
1 acre equals 0.4047 hectare.
1 acre equals 43,560 square feet.
1 acre equals 209 feet square, nearly.
1 square mile equals 2.59 square kilometers.
1 cubic foot equals 0.0283 cubic meter.
1 cubic foot of water weighs 62.5 pounds.
1 cubic meter per minute equals 0.5886 second-foot.
1 horsepower equals 550 foot-pounds per second.
1 horsepower equals 76.0 kilogram-meters per second.
1 horsepower equals 746 watts.
1 horsepower equals 1 second-foot falling 8.80 feet.
1½ horsepower equals about 1 kilowatt.

To calculate water power quickly: $\frac{\text{Sec.-ft.} \times \text{fall in feet}}{11}$ = net horsepower on water wheel realizing 80 per cent of the theoretical power.

EXPLANATION OF DATA.

For each regular current-meter gaging station the following data are given: Description of the station, list of discharge measurements, table of daily gage height, table of daily discharge, table of monthly and yearly discharge and run-off. For stations at weirs or dams the gage-height table is usually omitted.

In addition to statements regarding the location and installation of current-meter stations, the descriptions give information in regard to any conditions which may affect the constancy of the relation of gage height to discharge, covering such points as ice, logging, shifting channels, and backwater; also information regarding diversions which decrease the total flow at the measuring section. Statements are also made regarding the accuracy of the data.

The table of daily gage height shows the daily fluctuations of the surface of the river as found from the mean of the gage readings taken each day, usually in the morning and in the evening, though at many stations only one reading is made each day. At a comparatively few stations automatic gages are used, some of which give a continuous record of river stage in the form of a hydrograph and others a record printed at regular intervals, from which the mean daily gage height can be computed. The gage height given in the table represents the elevation of the surface of the water above the zero of the gage. All gage heights affected by the presence of ice in the streams or by backwater from obstructions are published as recorded, with suitable footnotes. The rating table is not applicable for such periods unless

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the proper corrections to the gage heights are known and applied. Attention is called to the fact that the zero of the gage is placed at an arbitrary datum and has no relation to zero flow or the bottom of the river. In general the zero is located somewhat below the lowest known flow, so that negative readings shall not occur.

In the tables of daily gage height the use of zeros in the hundredths place indicates the limits of accuracy to which the gage was read and to which the mean daily gage height was computed. If a gage is read to tenths or half-tenths once a day or to tenths twice a day, no zeros appear in the hundredths place for any stage. If the gage is read to half-tenths twice a day or to quarter-tenths or hundredths, regardless of the number of readings a day, the gage heights are published to hundredths, and zeros appear in the hundredths place, below a certain limiting stage. This limiting stage is so selected that the average error in the mean daily discharge, resulting from not using the mean daily gage height to hundredths above that stage, shall not be greater than 2 per cent. For automatic gages the allowable average error of the daily discharge has been taken as 1 per cent. The selection of the percentage is arbitrary, but it should be noted that the maximum error will in all cases be twice the average error. In like manner half-tenths are used from the hundredths limit to another higher limit, above which only tenths are used. It is the aim to have the gage height observations at each gaging station recorded to the degree of refinement required by the above method of use, but in practice it is found necessary, in order to avoid confusion in the gage observer's record, to have the observations for all stages recorded to the degree of refinement required for low stages, which usually necessitates readings to hundredths of a foot.

The discharge measurements and gage heights are the base data from which rating tables, daily discharge tables, and monthly discharge tables are computed.

The rating table gives, either directly or by interpolation, the discharge in second-feet corresponding to every stage of the river recorded during the period for which it is applicable. It is not published in this report, but can be determined from the tables of daily gage heights and daily discharge by plotting gage heights in feet as ordinates and discharge in second-feet as abscissas.

The table of daily discharge determined from the rating table gives the discharge in second-feet corresponding to the mean of the gage readings observed each day.

In the table of monthly discharge the column headed "Maximum" gives the mean flow, as determined from the rating table, for the day when the mean gage height was highest. As the gage height is the mean for the day, it does not indicate correctly the stage when the water surface was at crest height, and the corresponding discharge

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was consequently larger than given in the maximum column. Likewise, in the column of "Minimum" the quantity given is the mean flow for the day when the mean gage height was lowest. The column headed "Mean" is the average flow in cubic feet for each second during the month. On this the computations for the remaining columns, which are defined on pages 11–12, are based.

The base data presented in this report, unless otherwise stated in description of station, have been collected by the methods commonly used at current-meter gaging stations and described in standard textbooks. (See Pls. I and II.)

ACCURACY OF FIELD DATA AND COMPUTED RESULTS.

The accuracy of stream-flow data depends (1) on the permanence of channel and of the relation between discharge and stage, and (2) on the accuracy of observation of stage, measurement of discharge and interpretation of data.

In order to give engineers and others information regarding the probable accuracy of the computed results, footnotes are added to the daily discharge tables, stating the probable accuracy of the rating curves used, and an accuracy column is inserted in the monthly discharge table. For the rating curves "well defined" indicates, in general, that the rating is probably accurate within 5 per cent; "fairly well defined," within 10 per cent; "poorly defined" or "approximate" within 15 to 25 per cent. These notes are very general and are based on the plotting of the individual measurements with reference to the mean rating curve.

The accuracy column in the monthly discharge table does not apply to the maximum or minimum nor to any individual day, but to the monthly mean.

It is based on the accuracy of the rating, the probable reliability of the observer, the number of gage readings per day, the range of the fluctuation in stage, and knowledge of local conditions. In this column A indicates that the mean monthly flow is probably accurate within 5 per cent; B, within 10 per cent; C, within 15 per cent; D, within 25 per cent. Special conditions are covered by footnotes.

Even though the monthly means for any station may represent with a high degree of accuracy the quantity of water flowing past the gage, the figures showing discharge per square mile and depth of run-off in inches may be subject to gross errors which result from including in the measured drainage area large noncontributing districts or omitting estimates of water diverted for irrigation or other use. On this account the computations of "second-feet per square mile" and "run-off (depth in inches)" have not been made for stations draining areas having an annual rainfall of less than 20 inches, nor for those stations draining areas of over 20 inches of rainfall for which it is

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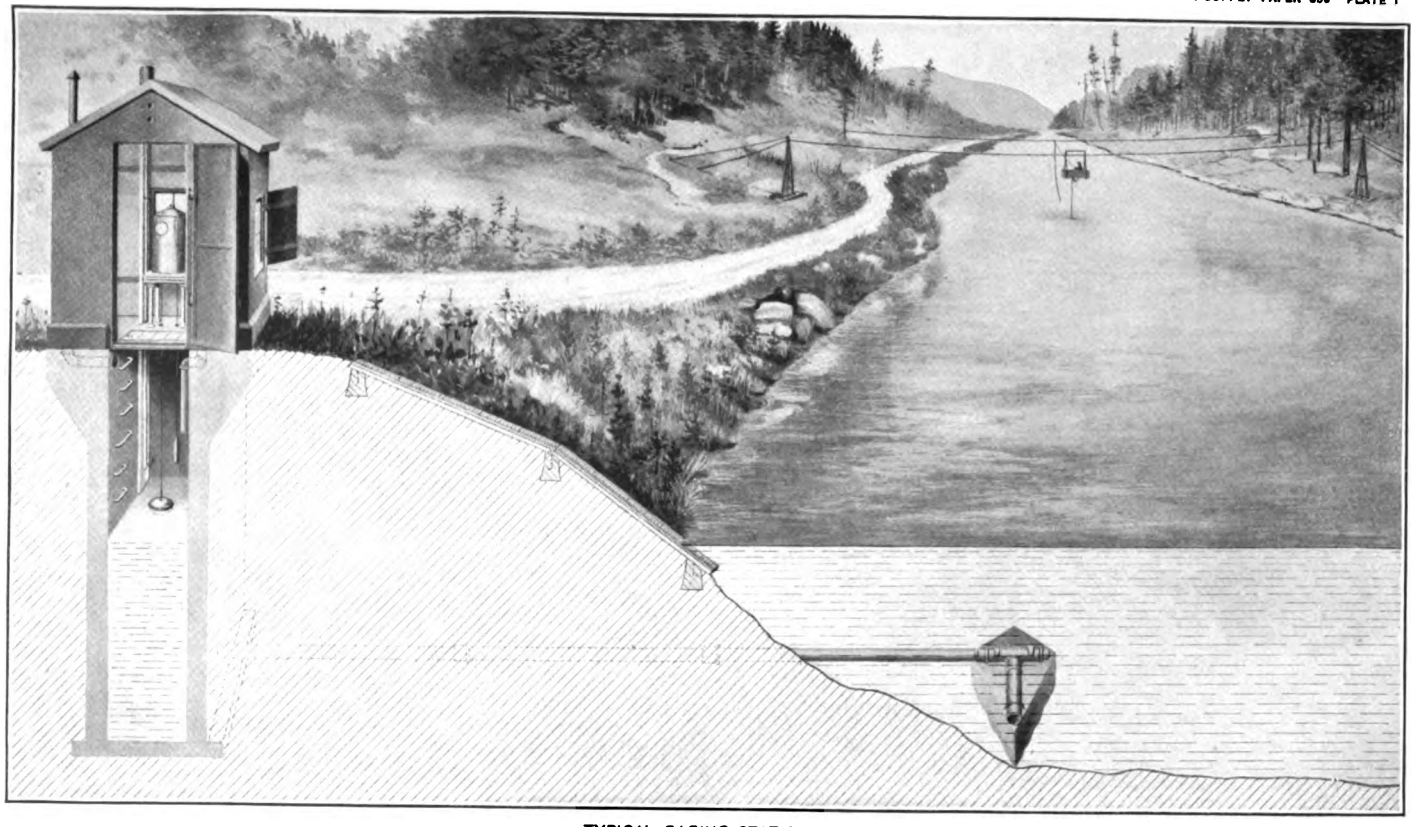

TYPICAL GAGING STATIONS.

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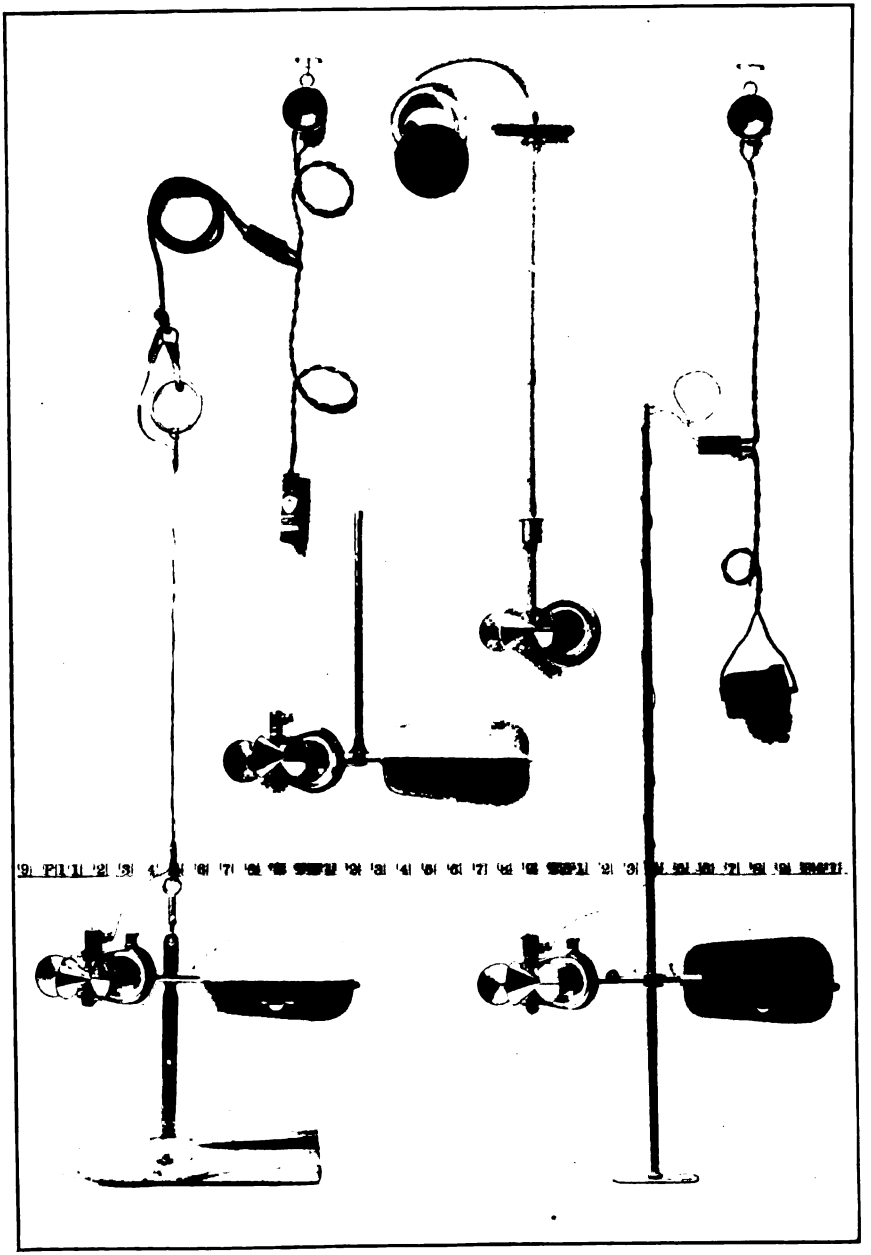

PRICE CURRENT METERS.

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believed that the computations would be uncertain and misleading because, of the presence of large noncontributing districts in the measured drainage area, of omitting estimates of water diverted for irrigation or other use, or of artificial control or unusual natural control of the flow of the river above the gaging station. All values of "second-feet per square mile" and "run-off (depth in inches)" previously published by the Survey should be used with extreme caution, and such values in this report should be used with care because of possible inherent sources of error not known to the Survey.

In general, the base data collected each year by the Survey engineers are published not only to comply with the law but also to afford any engineer the means of examining and adjusting to his own needs the results of the computations. The table of monthly discharge is so arranged as to give only a general idea of the flow at the station and should not be used for other than preliminary estimates. The determinations of daily discharge allow more detailed studies of the variation in flow by which the period of deficiency may be determined.

It should be borne in mind that the observations in each succeeding year may be expected to throw new light on data already collected and published, and the engineer who makes use of the figures presented in these papers should verify all ratings and make such adjustments for earlier years as may seem necessary.

COOPERATION.

Much of the work in Montana has been carried on under cooperative agreement with the United States Reclamation Service, the work being done by the Geological Survey and the expense borne by the Reclamation Service. The Legislature of the State of Montana made an appropriation for stream-gaging work, which was expended by the State engineer, as provided in the act, in accordance with paragraph 3, section 2244, of the Revised Codes of 1907 of the State of Montana, which reads as follows:

> The State engineer shall become conversant with the waterways of the State and the needs of the State as to irrigation matters, shall make, or cause to be made, measurements and calculations of the ordinary and flood discharge of streams, cooperating in this work as much as possible with the United States Geological Survey and the Montana Experiment Station; such measurements to be made on streams in order of their importance, provided that measurements already made, if deemed reliable, may be adopted.

This fund was expended largely on work in connection with the several Carey projects in Montana and in computing data on water-right filings and adjudications. A State hydrographer was employed who worked directly with the Geological Survey.

The expense of work on the Crow Reservation in Montana, the Standing Rock Reservation in North and South Dakota, and the

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Pine Ridge and Rosebud reservations in South Dakota was borne by the Office of Indian Affairs.

The work in Nebraska was carried on by the State engineer, Mr. D. D. Price, who paid all field expenses.

Other assistance in collecting records in the Missouri River basin is acknowledged in connection with the descriptions of the stations.

DIVISION OF WORK.

The field data in the upper Missouri River drainage basin were collected under the direction of W. A. Lamb, district engineer, assisted by B. E. Jones, R. R. Randell, J. M. Ray, junior engineers, J. B. Stewart, field assistant, and C. S. Heidel, State hydrographer.

The work in North Dakota was carried on by E. F. Chandler, assistant engineer.

The field data for three stations in the Yellowstone National Park were collected under the direction of G. C. Baldwin, district engineer, assisted by R. C. Pierce, junior engineer.

The field data for the Missouri River basin in Colorado and Wyoming were collected under the direction of Robert Follansbee, district engineer, assisted by R. H. Fletcher. The field work in Nebraska was carried on under the supervision of D. D. Price, State engineer, by D. P. Weeks, jr.

The ratings, special estimates, and studies of the completed data were made by W. A. Lamb, Robert Follansbee, B. E. Jones, and H. D. Padgett.

Computations were made by B. E. Jones and H. D. Padgett, assisted by J. G. Mathers, H. J. Dean, A. W. Harrington, and R. H. Fletcher. The completed data were prepared for publication by H. D. Padgett.

The report was edited by Mrs. B. D. Wood.

GAGING-STATION RECORDS.

MISSOURI RIVER PROPER.

RED ROCK RIVER BELOW RED ROCK RESERVOIR, NEAR MONIDA, MONT.

Location.—In sec. 32, T. 13 S., R. 6 W., just below the reservoir of the Red Rock Reservoir & Irrigation Co., 8 miles northeast of Monida and 15 miles east of Lima.

Records available.—July 22, 1911, to December 31, 1913. Miscellaneous measurements were made at this point on Red Rock River during the summer of 1910.

Drainage area.—About 560 square miles.

Gages.—A temporary staff gage about 300 yards downstream from the dam and a float gage in a concrete well on the right bank, at a 40-foot weir, about halfway between the dam and the staff gage. The 1911 records are referred to the staff gage. The 1912–13 records give the head on the weir.

Control.—Probably permanent; bed of stream composed of coarse gravel, pebbles, and bowlders; current strong.

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Discharge measurements.—Made by wading.
Winter flow.—Affected by ice.
Regulation.—Dam used to store flood waters, which are released during the later part of irrigation season.
Accuracy.—Both staff gage and weir readings should be reliable.

Discharge measurements of Red Rock River below Red Rock reservoir, near Monida, Mont., in 1913.

Date.	Hydrographer.	Head on weir.	Discharge.
		Feet.	*Sec.-ft.*
Aug. 7	C. S. Heidel	1.30	250
7	do	1.70	399
8	do	1.14	196
8	do	.86	118

Daily gage height, in feet, of Red Rock River below Red Rock reservoir, near Monida, Mont., for 1913.

[P. V. Maxwell, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.10	0.10	0.10	0.10	2.90	2.05	1.60	1.40	1.30	1.32	1.40	0.98
2	.10	.10	.10	.10	2.90	2.05	1.60	1.40	1.32	1.39	1.40	.70
3	.10	.10	.10	.10	2.90	2.05	1.60	1.40	1.38	1.36	1.40	.69
4	.10	.10	.10	.10	2.82	2.12	1.60	1.38	1.32	1.36	1.40	.54
5	.10	.10	.10	.10	2.80	2.20	1.60	1.35	1.40	1.35	1.40	.54
6	.10	.10	.10	.10	2.60	2.20	1.52	1.35	1.36	1.35	1.40	.54
7	.10	.10	.10	.10	2.42	2.20	1.40	1.50	1.35	1.35	1.40	.54
8	.10	.10	.10	.10	2.41	2.20	1.40	1.48	1.35	1.35	1.40	.34
9	.10	.10	.10	.10	2.41	2.20	1.28	1.26	1.36	1.35	1.40	.34
10	.10	.10	.10	.10	2.41	2.20	1.22	1.25	1.38	1.35	1.04	.34
11	.10	.10	.10	.18	2.42	2.10	1.22	1.28	1.35	1.35	.98	.34
12	.10	.10	.10	.63	2.42	2.10	1.25	1.27	1.39	1.40	.98	.34
13	.10	.10	.10	1.30	2.42	2.10	1.18	1.29	1.39	1.40	.98	.34
14	.10	.10	.10	1.80	2.42	2.08	1.15	1.28	1.35	1.38	.98	.34
15	.10	.10	.10	2.26	2.25	2.05	1.15	1.30	1.35	1.40	.99	.34
16	.10	.10	.10	2.59	2.00	2.02	1.11	1.30	1.36	1.40	.98	.34
17	.10	.10	.10	2.72	2.00	2.01	1.11	1.28	1.35	1.48	.98	.34
18	.10	.10	.10	2.80	2.00	1.99	1.08	1.28	1.30	1.54	.97	.34
19	.10	.10	.10	2.84	2.00	1.97	1.08	1.31	1.35	1.55	.97	.34
20	.10	.10	.10	2.92	2.00	1.72	1.06	1.30	1.34	1.48	.97	.34
21	.10	.10	.10	3.03	1.90	1.71	1.05	1.31	1.36	1.43	.98	.34
22	.10	.10	.10	3.04	1.90	1.62	1.04	1.33	1.35	1.42	.98	.33
23	.10	.10	.10	3.04	1.90	1.52	1.03	1.32	1.39	1.42	.98	.34
24	.10	.10	.10	3.02	1.90	1.42	1.04	1.31	1.38	1.40	.99	.34
25	.10	.10	.10	3.00	1.90	1.35	1.10	1.34	1.40	1.40	.99	.34
26	.10	.10	.10	2.98	1.90	1.35	1.16	1.30	1.34	1.45	.98	.34
27	.10	.10	.10	2.95	1.75	1.38	1.24	1.32	1.36	1.45	.98	.34
28	.10	.10	.10	2.90	1.60	1.45	1.28	1.32	1.37	1.40	.99	.34
29	.10	.....	.10	2.90	1.65	1.45	1.30	1.29	1.36	1.40	.98	.34
30	.10	.....	.10	2.90	1.72	1.56	1.30	1.30	1.34	1.40	.99	.34
31	.10	.....	.10	.....	1.91	.....	1.37	1.30	.....	1.40	.....	.34

NOTE.—Stream is controlled; observer's gage heights do not check the hydrographer's, because the flow was varied to enable him to rate the station.

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Daily discharge, in second-feet, of Red Rock River below Red Rock reservoir, near Monida, Mont., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5	5	5	5	1,040	565	360	280	245	252	280	149
2	5	5	5	5	1,040	565	360	280	252	276	280	58
3	5	5	5	5	1,040	565	360	280	273	266	280	95
4	5	5	5	5	987	600	360	273	252	266	280	84
5	5	5	5	5	975	640	360	262	280	262	280	86
6	5	5	5	5	860	640	328	262	266	262	280	58
7	5	5	5	5	761	640	280	320	262	262	280	58
8	5	5	5	5	756	640	280	312	262	262	280	30
9	5	5	5	5	756	640	238	232	266	262	280	30
10	5	5	5	5	756	640	219	228	273	262	165	30
11	5	5	5	11	761	590	219	238	262	262	149	30
12	5	5	5	73	761	590	228	235	276	280	149	30
13	5	5	5	245	761	590	206	242	276	280	149	30
14	5	5	5	445	761	580	197	238	262	273	149	30
15	5	5	5	673	668	565	197	245	262	280	151	30
16	5	5	5	854	540	550	185	245	266	280	149	30
17	5	5	5	927	540	545	185	238	262	312	149	30
18	5	5	5	975	540	535	176	238	245	336	146	30
19	5	5	5	999	540	525	176	248	262	340	146	30
20	5	5	5	1,050	540	409	171	245	259	312	146	30
21	5	5	5	1,110	490	404	168	248	266	292	149	30
22	5	5	5	1,120	490	368	165	256	262	288	149	29
23	5	5	5	1,120	490	328	162	252	276	288	149	30
24	5	5	5	1,110	490	288	165	248	273	280	151	30
25	5	5	5	1,100	490	262	182	259	280	280	151	30
26	5	5	5	1,080	490	262	200	245	259	300	149	30
27	5	5	5	1,060	422	273	225	252	266	300	149	30
28	5	5	5	1,040	360	300	238	252	270	280	151	30
29	5	.....	5	1,040	380	300	245	242	266	280	149	30
30	5	.....	5	1,040	409	344	245	245	259	280	151	30
31	5	.....	5	.....	495	.....	270	245	.....	280	.....	30

NOTE.—Daily discharge determined from a rating curve well defined below 550 second-feet and fairly well defined at higher stages. Change in rating curve for 1913 due to change in condition of channel above the weir.

Monthly discharge of Red Rock River below Red Rock reservoir, near Monida, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	5	5	5.0	307	C.
February	5	5	5.0	278	C.
March	5	5	5.0	307	C.
April	1,120	5	571	34,000	B.
May	1,040	360	658	40,500	B.
June	640	262	491	29,200	A.
July	360	162	237	14,600	A.
August	320	228	254	15,600	A.
September	280	245	235	15,800	A.
October	340	252	282	17,300	A.
November	280	146	189	11,200	A.
December	149	29	410	2,520	A.
The year	1,120	5	251	182,000	

NOTE.—Accuracy for January, February, and March reduced because of possible effect of ice.

BEAVERHEAD RIVER AT BARRATTS, MONT.

Location.—One mile above Barratts and 2 miles southwest of Dillon, Mont., in the SW. ¼ SW. ¼ sec. 20, T. 8 S., R. 9 W.

Records available.—August 12, 1907, to December 31, 1913.

Drainage area.—Not measured.

Gage.—A standard chain gage was installed on the downstream side of the bridge June 22, 1908, to replace the staff gage which had previously been used; datum of chain gage the same as that of the staff gage.

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Control.—Should not shift; rocky at the measuring section.

Discharge measurements.—Made from downstream side of the bridge.

Winter flow.—Stream remains open during the winter months.

Diversions.—Numerous diversions are made above the station. Decreed water rights, aggregating 85,866 inches of water, are filed on from Lima on Red Rock River to a point 10 miles above Twin Bridges. The three largest canals diverted below the station are Canyon Creek canal, appropriating 6,000 inches; Union canal, appropriating 4,000 inches; and Beaverhead canal, diverted just north of Dillon, appropriating 5,000 inches. The Union Electric Co., of Dillon, has a canal with a carrying capacity of 6,000 inches.

Beaverhead River is called Red Rock River from its source in Red Rock Lakes to the post office of Red Rock, below which it is called the Beaverhead. The principal tributaries to the Beaverhead above the station are Grasshopper Creek, 12 miles south of Dillon; Horse Prairie Creek, 20 miles south; and Rattlesnake and Blacktail Deer creeks. Irrigation has probably been practiced in Beaverhead Valley longer than in any other valley in Montana, ditches constructed in the early seventies being still in operation.

Discharge measurements of Beaverhead River at Barratts, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 3	C. S. Heidel	2.87	1,290
June 18	J. M. Ray	2.80	1,220
Aug. 6	C. S. Heidel	2.06	789

Daily gage height, in feet, of Beaverhead River at Barratts, Mont., for 1913.

[M. E. Meeds, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3.7	3.2	3.8	2.3	2.0	1.2	1.7	1.85	1.5
2	.....	3.7	3.0	3.8	2.4	2.0	1.2	1.7	1.9	1.4
3	.....	2.8	2.9	3.7	2.3	1.9	1.25	1.7	1.9	1.4
4	.....	2.3	2.9	3.6	2.2	1.9	1.25	1.7	1.9	1.3
5	.....	2.6	2.8	3.5	2.1	1.9	1.3	1.75	1.85	1.3
6	.....	2.8	2.8	3.4	2.0	2.2	1.3	1.8	1.85	1.3
7	.....	2.4	2.8	3.3	1.9	2.1	1.3	1.8	1.55	1.25
8	.....	2.2	3.1	3.2	1.65	2.1	1.3	1.8	1.9	1.2
9	.....	2.2	3.4	3.2	1.6	1.9	1.25	1.8	1.9	1.2
10	.....	2.2	3.3	3.3	1.4	1.9	1.2	1.8	1.9	1.1
11	.....	2.4	3.4	3.4	1.4	1.9	1.2	1.85	1.85	1.1
12	.....	2.7	3.4	3.8	1.3	1.85	1.25	1.85	1.8	1.1
13	.....	3.0	3.3	4.3	1.2	1.8	1.3	1.85	1.8	1.1
14	.....	3.4	3.2	4.3	1.2	1.65	1.3	1.9	1.8	1.1
15	1.0	3.4	3.2	3.9	1.2	1.5	1.35	1.9	1.8	1.1
16	1.0	3.2	3.1	3.9	1.2	1.5	1.35	1.9	1.85	1.1
17	1.2	2.8	2.8	3.8	1.2	1.5	1.35	1.9	1.85	1.1
18	1.05	2.8	2.8	2.8	1.2	1.4	1.4	1.85	1.8	1.1
19	1.1	3.2	3.2	2.6	1.2	1.4	1.4	1.9	1.8	1.1
20	1.2	3.3	3.2	2.6	1.2	1.35	1.4	1.9	1.8	.....
21	1.05	3.2	3.1	2.5	1.2	1.2	1.45	1.9	1.8	.....
22	1.05	3.3	2.8	2.4	1.2	1.2	1.5	1.9	1.7	.....
23	1.0	3.3	2.4	2.2	1.2	1.2	1.5	1.85	1.7	.....
24	1.0	3.0	2.5	2.2	1.25	1.25	1.55	1.8	1.7	.....
25	.95	3.0	2.7	2.6	1.4	1.25	1.6	1.85	1.65	.....
26	.90	2.9	3.0	2.6	1.45	1.25	1.6	1.8	1.6	.....
27	.95	3.1	3.2	3.1	1.55	1.25	1.6	1.8	1.6	.....
28	1.1	3.2	3.4	3.2	2.1	1.25	1.6	1.8	1.6	.....
29	1.3	3.2	3.6	3.0	2.2	1.2	1.65	1.8	1.5	.....
30	2.3	3.0	3.8	2.8	2.0	1.2	1.65	1.8	1.5	.....
31	3.2	.....	4.0	.....	2.0	1.2	.....	1.8	.....	.....

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Daily discharge, in second-feet, of Beaverhead River at Barratts, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1,860	1,510	1,930	940	760	350	600	675	500
2	.....	1,860	1,380	1,930	1,000	760	350	600	700	450
3	.....	1,240	1,310	1,860	940	700	375	600	700	450
4	.....	940	1,310	1,790	880	700	375	600	700	400
5	.....	1,120	1,240	1,720	820	700	400	625	675	400
6	.....	1,240	1,240	1,650	760	880	400	650	675	400
7	.....	1,000	1,240	1,580	700	820	400	650	675	375
8	.....	880	1,440	1,510	575	820	400	650	700	350
9	.....	880	1,650	1,510	550	700	375	650	700	350
10	.....	880	1,580	1,580	450	700	350	650	700	305
11	.....	1,000	1,650	1,650	450	700	350	675	675	305
12	.....	1,180	1,650	1,930	400	675	375	675	650	305
13	.....	1,380	1,580	2,280	350	650	400	675	650	305
14	.....	1,650	1,510	2,280	350	575	400	700	650	305
15	265	1,650	1,510	2,000	350	500	425	700	650	305
16	265	1,510	1,440	2,000	350	500	425	700	675	305
17	350	1,240	1,240	1,930	350	500	425	700	675	305
18	285	1,240	1,240	1,240	350	450	450	675	650	305
19	305	1,510	1,510	1,120	350	450	450	700	650	305
20	350	1,580	1,510	1,120	350	425	450	700	650	305
21	285	1,510	1,440	1,060	350	350	475	700	650	285
22	285	1,580	1,240	1,000	350	350	500	700	600	285
23	265	1,580	1,000	880	350	350	500	675	600	285
24	265	1,380	1,060	880	375	375	525	650	600	285
25	245	1,380	1,180	1,120	450	375	550	675	575	285
26	225	1,310	1,380	1,120	475	375	550	650	550	265
27	245	1,440	1,510	1,440	525	375	550	650	550	265
28	305	1,510	1,650	1,510	820	375	550	650	550	265
29	400	1,510	1,790	1,380	880	350	575	650	500	265
30	940	1,380	1,930	1,240	760	350	575	650	500	265
31	1,510	.....	2,070	.....	760	350	.....	650	.....	265

NOTE.—Discharge determined from a rating curve well defined between 500 and 1,400 second-feet and fairly well defined at other stages. Discharge estimated Dec. 20–31.

Monthly discharge of Beaverhead River at Barratts, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
Mar. 15–31	1,510	225	399	13,500	B.
April	1,860	880	1,350	80,300	A.
May	2,070	1,000	1,450	89,200	B.
June	2,280	880	1,540	91,600	B.
July	1,000	350	560	34,400	A.
August	880	350	546	33,600	A.
September	575	350	442	26,300	B.
October	700	600	660	40,600	A.
November	700	500	638	38,000	A.
December	500	265	324	19,900	B.
The period	.....	.....	.....	467,900	

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JEFFERSON RIVER NEAR SILVERSTAR, MONT.

Location.—In sec. 23, T. 2 S., R. 6 W., at the big highway bridge on the road from Silverstar to Iron Rod, a station on a branch of the Northern Pacific Railway. The principal tributaries below the station are Pipestone and Whitetail creeks and Boulder River.

Records available.—August 11, 1910, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff gage fastened to pier on downstream side.

Control.—Gravel.

Discharge measurements.—Made from the lower side of highway bridge.

Winter flow.—Ice present.

Diversions.—Irrigation is carried on extensively from the headwaters of this stream to its mouth.

Discharge measurements of Jefferson River near Silverstar, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 7	C. S. Heidel	3.88	3,280
June 20	do	5.68	7,620
Aug. 11	do	3.20	1,710
Oct. 10	do	3.10	1,610

Daily gage height, in feet, of Jefferson River near Silverstar, Mont., for 1913.

[C. A. Barkell, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.55	4.4	8.0	5.8	3.1	2.65	2.95	3.2	2.45
2	3.6	4.4	7.7	5.7	2.95	2.65	2.9	3.25	.....
3	3.6	4.5	7.6	5.4	2.7	2.7	2.85	3.35	.....
4	3.6	4.4	7.4	5.1	2.6	2.7	2.85	3.25	.....
5	3.6	4.3	7.4	5.0	2.55	2.8	2.9	3.2	.....
6	3.5	4.2	6.9	4.9	2.25	2.95	2.9	3.2	.....
7	3.45	3.8	6.7	4.6	2.4	2.8	2.9	3.15	.....
8	3.45	3.9	6.7	4.5	2.45	2.75	2.95	3.1	.....
9	3.35	4.2	6.8	4.4	2.6	2.7	3.0	3.1	.....
10	3.3	4.2	6.9	4.2	3.0	2.7	3.1	3.1	.....
11	3.5	4.8	7.1	4.0	3.2	2.7	3.0	3.1	.....
12	3.8	5.5	8.2	3.6	3.5	2.75	3.0	3.15	.....
13	4.1	5.9	8.6	3.5	3.5	2.8	3.1	3.15	.....
14	4.4	5.9	8.7	3.4	3.45	2.85	3.1	3.2	.....
15	4.8	5.9	8.8	3.35	3.4	2.85	3.1	3.25	.....
16	5.4	5.9	8.5	3.3	3.3	2.9	3.15	3.3	.....
17	5.2	5.8	7.8	3.15	3.25	2.9	3.2	3.3	.....
18	5.2	5.7	7.2	3.15	3.2	2.9	3.3	3.25	.....
19	5.1	5.4	6.1	2.9	3.2	2.85	3.25	3.2	.....
20	4.8	5.4	5.6	2.9	3.15	2.85	3.2	3.15	.....
21	4.7	5.2	5.4	2.85	3.0	2.9	3.2	3.0	.....
22	4.6	5.3	4.9	2.8	3.0	2.85	3.15	3.0	.....
23	4.4	5.7	4.8	2.6	3.0	2.85	3.15	3.0	.....
24	4.2	6.1	4.7	2.6	2.85	2.85	3.15	3.0	.....
25	4.1	6.3	5.1	2.75	2.8	2.9	3.15	3.0	.....
26	4.2	6.3	5.4	2.8	2.8	2.9	3.2	2.95	.....
27	4.3	6.4	5.6	2.95	2.7	3.0	3.2	2.95	.....
28	4.3	6.4	5.8	2.75	2.7	3.05	3.25	2.9	.....
29	4.3	7.3	6.0	3.0	2.7	3.15	3.25	2.9	.....
30	4.2	8.1	6.0	3.05	2.7	3.0	3.2	2.95	.....
31	.....	8.2	.....	3.2	2.65	.....	3.15	.....	.....

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Daily discharge, in second-feet, of Jefferson River near Silverstar, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,360	4,220	14,100	7,800	1,600	1,000	1,380	1,760	805
2	2,460	4,220	13,200	7,530	1,380	1,000	1,310	1,840	.....
3	2,460	4,460	12,900	6,730	1,060	1,060	1,240	2,000	.....
4	2,460	4,220	12,300	5,950	950	1,060	1,240	1,840	.....
5	2,460	3,990	12,300	5,690	900	1,180	1,310	1,760	.....
6	2,270	3,760	10,900	5,440	630	1,380	1,310	1,760	.....
7	2,180	2,870	10,300	4,700	760	1,180	1,310	1,680	.....
8	2,180	3,090	10,300	4,460	805	1,120	1,380	1,600	.....
9	2,000	3,760	10,600	4,220	950	1,060	1,450	1,600	.....
10	1,920	3,760	10,900	3,760	1,450	1,060	1,600	1,600	.....
11	2,270	5,190	11,400	3,310	1,760	1,060	1,450	1,600	.....
12	2,870	6,990	14,700	2,460	2,270	1,120	1,450	1,680	.....
13	3,530	8,070	15,900	2,270	2,270	1,180	1,600	1,680	.....
14	4,220	8,070	16,200	2,090	2,180	1,240	1,600	1,760	.....
15	5,190	8,070	16,500	2,000	2,090	1,240	1,600	1,840	.....
16	6,730	8,070	15,600	1,920	1,920	1,310	1,680	1,920	.....
17	6,210	7,800	13,500	1,680	1,840	1,310	1,760	1,920	.....
18	6,210	7,530	11,700	1,680	1,760	1,310	1,920	1,840	.....
19	5,950	6,730	8,610	1,310	1,760	1,240	1,840	1,760	.....
20	5,190	6,730	7,260	1,310	1,680	1,240	1,760	1,680	.....
21	4,940	6,210	6,730	1,240	1,450	1,310	1,760	1,450	.....
22	4,700	6,470	5,440	1,180	1,450	1,240	1,680	1,450	.....
23	4,220	7,530	5,190	950	1,450	1,240	1,680	1,450	.....
24	3,760	8,610	4,940	950	1,240	1,240	1,680	1,450	.....
25	3,530	9,170	5,950	1,120	1,180	1,310	1,680	1,450	.....
26	3,760	9,170	6,730	1,180	1,180	1,310	1,760	1,380	.....
27	3,990	9,450	7,260	1,380	1,060	1,450	1,760	1,380	.....
28	3,990	9,450	7,800	1,120	1,060	1,520	1,840	1,310	.....
29	3,990	12,000	8,340	1,450	1,060	1,680	1,840	1,310	.....
30	3,760	14,400	8,340	1,520	1,060	1,450	1,760	1,380	.....
31	.....	14,700	.....	1,760	1,000	.....	1,680	.....	.....

NOTE.—Daily discharge determined from a fairly well defined rating curve.

Monthly discharge of Jefferson River near Silverstar, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	6,730	1,920	3,730	222,000	B.
May	14,700	2,870	7,060	434,000	B.
June	16,500	4,940	10,500	625,000	B.
July	7,800	950	2,910	179,000	B.
August	2,270	630	1,390	85,500	B.
September	1,680	1,000	1,240	73,800	B.
October	1,920	1,240	1,590	97,800	B.
November	2,000	1,310	1,640	97,600	B.
The period	.....	.....	.....	1,810,000	

MISSOURI RIVER AT TOSTON, MONT.

Location.—In the SW. ¼ sec. 23, T. 5 N., R. 2 E., at the highway bridge crossing Missouri River at Toston, Mont.; about 25 miles below the union of Gallatin, Jefferson, and Madison rivers.

Records available.—April 5, 1910, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Standard chain gage attached to downstream side of bridge.

Control.—Rocky and permanent.

Discharge measurements.—Made from cable just above bridge.

Winter flow.—Affected by ice.

Cooperation.—Gage-height record furnished by the Montana Power Co. Estimates of winter flow at Canyon Ferry, 40 miles below Toston, are also furnished by the Montana Power Co.

The following measurement was made by R. R. Randell:
June 6, 1913. Gage height, 8.82 feet; discharge, 26,200 second-feet.

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Daily gage height, in feet, of Missouri River at Toston, Mont., for 1913.

[W. B. Lorents, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	6.6	5.5	4.4	5.3	9.4	6.6	4.7	3.5	4.1	4.2	3.9
2	3.6	6.4	5.4	4.3	5.2	9.3	6.4	4.7	3.6	3.9	4.2	3.8
3	3.7	6.4	5.2	4.2	5.0	9.1	6.3	4.6	3.7	3.9	4.2	3.7
4	3.6	5.6	4.5	4.3	4.9	9.0	.....	4.5	3.75	3.9	4.2	3.6
5	3.2	5.3	4.4	4.6	5.0	9.0	6.4	4.5	3.7	3.95	4.3	3.6
6	3.0	5.9	4.4	4.8	4.8	8.8	6.2	4.4	3.6	3.95	4.3	3.5
7	3.1	6.0	4.2	4.8	4.8	8.7	6.0	4.4	3.6	4.1	4.2	3.5
8	3.5	5.4	4.1	4.7	5.1	8.4	5.9	4.4	3.6	4.1	4.2	3.55
9	3.55	5.6	4.1	4.7	5.4	8.4	5.6	4.4	3.65	4.2	4.2	3.7
10	3.55	5.5	4.2	4.6	5.8	8.3	5.2	4.4	3.7	4.1	4.2	3.5
11	3.7	5.6	4.1	4.5	6.1	8.2	4.8	4.5	3.7	4.1	4.3	3.65
12	7.1	5.9	4.0	4.7	6.4	8.5	4.7	4.4	.....	4.1	4.2	3.6
13	7.8	6.2	3.9	4.8	6.5	8.3	4.6	4.4	3.7	4.2	4.2	3.6
14	7.85	6.4	4.0	5.1	6.6	8.4	4.3	4.4	3.7	4.3	4.2	3.65
15	7.85	6.4	3.85	5.3	6.6	8.8	4.2	4.4	3.7	4.3	4.2	3.75
16	8.0	6.5	3.8	5.3	6.3	8.8	4.1	4.3	3.65	4.3	4.2	2.75
17	7.8	6.9	3.7	5.5	6.1	8.5	3.9	4.2	3.7	4.3	4.2	3.7
18	7.5	7.0	3.7	5.7	6.0	8.0	3.85	4.2	3.7	4.2	4.1	3.75
19	7.4	6.8	3.65	5.6	6.2	7.5	3.9	4.2	3.7	4.1	4.2	4.0
20	7.5	6.4	3.2	5.5	6.2	7.3	3.85	4.0	3.7	4.1	4.2	3.85
21	7.2	6.2	3.6	5.4	6.1	6.9	3.8	3.9	3.6	4.2	4.2	3.9
22	7.1	6.2	3.4	5.4	6.1	6.6	3.95	3.9	3.7	4.2	4.0	3.85
23	7.5	6.2	3.6	5.4	5.9	6.4	3.85	3.85	3.8	4.1	4.0	3.9
24	7.6	6.0	3.5	5.4	6.3	6.3	3.90	3.75	3.7	4.0	4.0	3.85
25	7.1	5.9	3.5	5.1	6.7	6.2	3.8	3.7	3.75	4.2	3.9	3.8
26	6.9	5.9	3.4	5.0	7.0	6.2	3.85	3.7	3.9	4.2	4.0	3.65
27	6.6	5.8	3.5	4.9	7.5	6.4	4.05	3.7	3.9	4.1	4.0	3.8
28	6.5	5.5	3.9	5.0	7.8	6.5	4.2	3.7	3.9	4.1	4.0	4.0
29	6.4	.....	4.2	5.0	8.6	6.8	4.4	3.7	4.0	4.2	3.9	3.8
30	6.5	.....	4.3	.....	8.8	6.8	4.6	3.65	4.2	4.2	4.0	3.7
31	6.6	.....	4.3	.....	9.1	.....	4.7	3.65	.....	4.2	.....	3.7

NOTE.—Gage heights Jan. 1 to Mar. 19 probably affected by ice.

Daily discharge, in second-feet, of Missouri River at Toston, Mont., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2,420	2,770	3,080	5,940	9,560	29,800	15,400	7,080	3,110	4,890	5,230	4,250
2	2,680	2,860	3,410	5,580	9,130	29,300	14,500	7,080	3,380	4,250	5,230	3,950
3	3,100	2,930	3,310	5,230	8,300	28,200	14,000	6,690	3,660	4,250	5,230	3,660
4	2,650	2,730	4,250	5,580	7,890	27,700	14,200	6,310	3,800	4,250	5,230	3,380
5	2,120	2,050	4,780	6,690	8,300	27,700	14,500	6,310	3,660	4,400	5,580	3,380
6	1,310	2,130	4,090	7,480	7,480	26,600	13,500	5,940	3,380	4,400	5,580	3,110
7	1,630	1,770	4,120	7,480	7,480	26,100	12,600	5,940	3,380	4,890	5,230	3,110
8	1,310	1,960	4,510	7,080	8,710	24,500	12,200	5,940	3,380	4,890	5,230	3,240
9	1,060	1,480	4,090	7,080	9,990	24,500	10,800	5,940	3,520	5,230	5,230	3,660
10	1,620	1,790	4,560	6,690	11,700	24,000	9,130	5,940	3,660	4,890	5,230	3,110
11	1,900	2,200	4,410	6,310	13,100	23,500	7,480	6,310	3,660	4,890	5,580	3,520
12	2,020	2,800	4,580	7,080	14,500	25,000	7,080	5,940	3,660	4,890	5,230	3,380
13	1,680	2,540	4,280	7,480	15,000	24,000	6,690	5,940	3,660	5,230	5,230	3,380
14	1,770	3,000	3,750	8,710	15,400	24,500	5,580	5,940	3,660	5,580	5,230	3,520
15	2,130	3,730	3,940	9,560	15,400	26,600	5,230	5,940	3,660	5,580	5,230	3,800
16	2,740	3,000	4,020	9,560	14,000	26,600	4,890	5,580	3,520	5,580	5,230	3,800
17	2,910	3,600	3,890	10,400	13,100	25,000	4,250	5,230	3,660	5,580	5,230	3,660
18	2,640	4,420	4,030	11,300	12,600	22,400	4,100	5,230	3,660	5,230	4,890	3,800
19	2,610	4,500	3,390	10,800	13,500	19,900	4,250	5,230	3,660	4,890	5,230	4,560
20	2,590	4,270	2,360	10,400	13,500	18,900	4,100	4,560	3,660	4,890	5,230	4,100
21	2,370	3,820	3,380	9,990	13,100	16,900	3,950	4,250	3,380	5,230	5,230	4,250
22	2,340	3,700	2,850	9,990	13,100	15,400	4,400	4,250	3,660	5,230	4,560	4,100
23	2,520	3,410	3,380	9,990	12,200	14,500	4,100	4,100	3,950	4,890	4,560	4,250
24	3,200	3,320	3,110	9,990	14,000	14,000	4,250	3,800	3,660	4,560	4,560	4,100
25	2,860	3,520	3,110	8,710	15,900	13,500	3,950	3,660	3,800	5,230	4,250	3,950
26	3,020	3,270	2,850	8,300	17,400	13,500	4,100	3,660	4,250	5,230	4,560	3,520
27	3,040	3,210	3,110	7,890	19,900	14,500	4,720	3,660	4,250	4,890	4,560	3,950
28	3,080	3,020	4,250	8,300	21,400	15,000	5,230	3,660	4,250	4,890	4,560	4,560
29	3,120	.....	5,230	8,300	25,600	16,400	5,940	3,660	4,560	5,230	4,250	3,950
30	3,280	.....	5,580	8,930	26,600	16,400	6,690	3,520	5,230	5,230	4,560	3,660
31	3,110	.....	5,580	.....	28,200	.....	7,080	3,520	.....	5,230	.....	3,660

NOTE.—Discharge determined from a rating curve fairly well defined between 1,560 and 28,000 second-feet. Discharges for the period Jan. 1 to Mar. 19 represent flow at Canyon Ferry, about 40 miles below Toston, and were furnished by Montana Power Co. No large tributaries enter between the two stations, and the flow at Canyon Ferry during this period ought not to exceed that at Toston by more than 5 per cent.

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Monthly discharge of Missouri River at Toston, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	3,280	1,310	2,430	149,000	
February	4,500	1,480	2,990	166,000	
March	5,580	2,360	3,910	240,000	
April	11,300	5,230	8,230	490,000	B.
May	28,200	7,480	14,100	867,000	B.
June	29,800	13,500	21,800	1,300,000	B.
July	15,400	3,950	7,710	474,000	B.
August	7,080	3,520	5,190	319,000	B.
September	5,230	3,110	3,750	223,000	B.
October	5,580	4,250	4,980	306,000	B.
November	5,580	4,250	5,030	299,000	B.
December	4,560	3,110	3,750	231,000	B.
The year	29,800	1,310	6,990	5,060,000	

NOTE.—Estimates for the period Jan. 1 to Mar. 19 represent flow at Canyon Ferry, about 40 miles below Toston.

MISSOURI RIVER AT CASCADE, MONT.

Location.—In sec. 35, T. 18 N., R. 1 W. At the highway bridge, 100 yards from the Great Northern Railway, on the east side of the town of Cascade, Mont.

Records available.—July 20, 1902, to December 31, 1913.

Drainage area.—18,300 square miles.

Gage.—Standard chain gage attached to bridge.

Control.—Probably permanent except at extreme flood stages.

Discharge measurements.—Made from lower side of bridge.

Winter flow.—Affected by ice.

Storage.—The Montana Power Co. has a large reservoir near Helena, between the stations at Toston and Cascade.

The most important tributaries between this station and the station at Toston, above, are Dearborn River, Little Prickly Pear Creek, and Prickly Pear Creek. Although irrigation is extensively practiced in the Missouri River Valley, the water is taken from the tributary streams, the Missouri itself being little used because of its high banks and great variation in flow and the difficulty of diversion.

Discharge measurements of Missouri River at Cascade, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
June 7	R. R. Randell	11.80	29,600
Sept. 19	J. M. Ray	4.71	4,050

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Daily gage height, in feet, of Missouri River at Cascade, Mont., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.6	5.7	6.0	6.5	6.8	11.6	8.6	5.6	4.6	4.9	5.6	5.2
2	5.3	5.6	6.0	6.5	7.0	12.0	8.6	5.8	3.9	4.7	5.6	5.3
3	5.9	5.6	6.5	5.8	6.8	12.2	8.4	5.7	4.3	4.8	5.7	5.2
4	5.8	5.3	5.8	6.4	6.7	12.2	8.2	5.4	4.2	5.2	5.7	5.2
5	5.6	5.7	6.0	5.9	6.6	12.3	8.1	5.8	4.3	5.2	5.6	5.0
6	5.1	6.0	6.2	6.0	6.4	12.0	8.1	5.6	4.3	5.2	5.5	4.7
7	5.4	6.0	6.2	5.9	6.3	11.8	8.1	5.4	4.2	5.0	5.4	4.6
8	6.1	6.1	6.4	6.6	6.4	11.3	7.9	5.4	3.95	5.1	5.4	4.4
9	6.1	5.8	6.7	6.8	6.3	11.3	7.7	5.4	4.1	5.2	5.7	4.6
10	5.9	5.6	6.6	6.5	6.6	11.1	7.5	5.3	4.2	5.1	5.6	4.6
11	6.1	5.8	6.2	6.3	7.0	11.0	7.2	5.1	4.3	5.2	5.5	4.5
12	6.1	5.8	6.4	6.0	7.3	10.8	6.6	5.0	4.05	5.6	5.5	4.6
13	5.9	5.8	6.0	6.0	8.0	10.6	6.0	5.0	4.05	5.7	5.5	4.5
14	6.0	5.8	6.1	6.2	8.3	10.9	6.0	5.0	4.3	5.8	5.4	4.5
15	6.1	5.8	6.2	6.5	8.5	11.2	5.8	5.2	4.4	5.6	5.3	4.4
16	6.0	6.0	6.0	6.8	8.3	11.1	5.4	5.1	4.05	5.6	5.4	4.2
17	5.8	5.9	4.8	7.0	8.1	11.3	4.6	5.0	4.15	5.6	5.4	4.4
18	5.9	6.2	4.7	7.0	8.5	11.6	4.0	4.8	4.0	5.6	5.6	4.6
19	5.7	6.3	7.2	7.1	8.0	11.2	4.0	5.0	4.6	5.6	5.5	4.8
20	5.8	6.4	7.2	7.4	8.0	11.0	4.3	4.8	4.8	5.5	5.5	4.8
21	6.1	6.6	7.1	7.2	8.0	9.7	4.4	4.9	4.5	5.3	5.5	5.0
22	6.2	6.4	6.6	7.2	8.0	9.0	4.6	4.6	4.6	5.4	5.1	8.2
23	6.0	6.2	6.6	7.3	7.9	8.9	4.7	4.6	4.8	5.3	5.1	8.1
24	6.2	6.0	6.1	7.2	7.9	8.6	4.1	4.5	5.0	5.4	5.0	8.0
25	6.2	6.0	5.6	7.1	7.9	6.5	4.2	4.6	4.6	5.6	5.2	7.4
26	6.1	5.7	5.5	6.9	8.2	7.7	4.5	4.6	4.4	5.4	5.2	7.2
27	5.8	5.8	6.5	6.4	8.9	8.0	4.8	4.5	4.3	5.1	5.2	7.2
28	6.0	6.2	6.2	6.6	9.2	8.2	4.7	4.6	4.6	5.4	5.1	7.5
29	6.0	.....	5.8	6.6	10.1	8.2	4.7	4.4	4.4	5.5	5.2	7.4
30	5.8	.....	8.1	5.7	10.6	8.4	5.0	4.6	4.8	5.4	5.2	7.0
31	5.7	.....	5.9	.....	11.2	.....	5.1	4.4	.....	5.4	.....	7.1

NOTE.—Gage heights Jan. 1 to Mar. 30 and Dec. 22 to 31 affected by ice.

Daily discharge, in second-feet, of Missouri River at Cascade, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	9,900	11,000	29,300	17,900	6,750	3,850	4,650	6,750	5,510
2	9,900	11,800	30,800	17,900	7,410	2,200	4,110	6,750	5,810
3	7,410	11,000	31,600	17,100	7,080	3,100	4,380	7,080	5,510
4	9,530	10,700	31,600	16,400	6,120	2,860	5,510	7,080	5,510
5	7,750	10,300	31,900	16,000	7,410	3,100	5,510	6,750	4,930
6	8,100	9,530	30,800	16,000	6,750	3,100	5,510	6,430	4,110
7	7,750	9,160	30,000	16,000	6,120	2,860	4,930	6,120	3,850
8	10,300	9,530	28,100	15,200	6,120	2,300	5,220	6,120	3,340
9	11,000	9,160	28,100	14,500	6,120	2,630	5,510	7,080	3,850
10	9,900	10,300	27,400	13,700	5,810	2,860	5,220	6,750	3,850
11	9,160	11,800	27,000	12,600	5,220	3,100	5,510	6,430	3,590
12	8,100	12,900	26,200	10,300	4,930	2,520	6,750	6,430	3,850
13	8,100	15,600	25,500	8,100	4,930	2,520	7,080	6,430	3,590
14	8,800	16,700	26,600	8,100	4,930	3,100	7,410	6,120	3,590
15	9,900	17,500	27,800	7,410	5,510	3,340	6,750	5,810	3,340
16	11,000	16,700	27,400	6,120	5,220	2,520	6,750	6,120	2,860
17	11,800	16,000	28,100	3,850	4,930	2,740	6,750	6,120	3,340
18	11,800	17,500	29,300	2,410	4,380	2,410	6,750	6,750	3,850
19	12,200	15,600	27,800	2,410	4,930	3,850	6,750	6,430	4,380
20	13,300	15,600	27,000	3,100	4,380	4,380	6,430	6,430	4,380
21	12,600	15,600	22,100	3,340	4,650	3,590	5,810	6,430	4,930
22	12,600	15,600	19,400	3,850	3,850	3,850	6,120	5,220	.....
23	12,900	15,200	19,000	4,110	3,850	4,380	5,810	5,220	.....
24	12,600	15,200	17,900	2,630	3,590	4,930	6,120	4,930	.....
25	12,200	15,200	9,900	2,860	3,850	3,850	6,750	5,510	.....
26	11,400	16,400	14,500	3,590	3,850	3,340	6,120	5,510	.....
27	9,530	19,000	15,600	4,380	3,590	3,100	5,220	5,510	.....
28	10,300	20,200	16,400	4,110	3,850	3,850	6,120	5,220	.....
29	10,300	23,600	16,400	4,110	3,340	3,340	6,430	5,510	.....
30	7,080	25,500	17,100	4,930	3,850	4,380	6,120	5,510	.....
31	.....	27,800	.....	5,220	3,340	.....	6,120	.....	.....

NOTE.—Discharge determined from a fairly well-defined rating curve. Discharge Dec. 22–31 estimated from flow at Toston, Mont., at 4,500 second-feet.

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Monthly discharge of Missouri River at Cascade, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	.....	a 2,800	172,000	C.
February	.....	.....	a 3,600	200,000	C.
March	.....	.....	a 4,700	289,000	C.
April	13,300	7,080	10,200	607,000	B.
May	27,800	9,160	15,100	928,000	B.
June	31,900	9,900	24,700	1,470,000	B.
July	17,900	2,410	8,650	532,000	B.
August	7,410	3,340	5,050	311,000	B.
September	4,930	2,200	3,260	194,000	B.
October	7,410	4,110	5,940	365,000	B.
November	7,080	4,930	6,150	366,000	B.
December	5,810	.....	4,290	264,000	C.
The year	31,900	.....	7,870	5,700,000	

a Estimated from records of flow at Canyon Ferry dam furnished by the Missouri River Power Co. See footnote to table of daily discharge at Toston, Mont.

MISSOURI RIVER AT FORT BENTON, MONT.

Location.—In NE. ¼, sec. 26, T. 24 N., R. 8 E., at the public highway bridge at Fort Benton, Mont.

Records available.—July 1, 1902, to April 27, 1910, gage heights recorded by United States Weather Bureau; April 28, 1910, to December 31, 1913, United States Geological Survey records for parts of years.

Drainage area.—24,600 square miles.

Gage.—A Mott gage installed April 11, 1907, on upstream side of bridge; gage heights for 1911, 1912, and 1913 are referred to the datum used by the United States Army engineers from 1881 to 1890, which is 0.43 foot higher than that used by the United States Geological Survey in 1910.

Control.—Probably permanent except in flood.

Discharge measurements.—Made from downstream side of bridge.

Winter flow.—Affected by ice.

Accuracy.—Conditions for obtaining accurate discharge data are good.

Discharge measurements of Missouri River at Fort Benton, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Mar 26	R. R. Randell	0.62	5,150
June 7	J. B. Stewart	8.20	43,300
July 8	....do	4.66	19,500
Nov. 14	W. A. Lamb	1.72	7,360

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Daily gage height, in feet, of Missouri River at Fort Benton, Mont., for 1913.

[W. P. Ward, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.3	.....	.....	.....	1.1	1.3	0.9	1.8	1.4
2	.....	2.7	.....	.....	.....	1.1	1.3	.9	1.8	1.4
3	.....	2.8	.....	.....	.....	1.1	1.1	.9	1.9	1.4
4	.....	2.3	.....	.....	.....	1.1	1.0	1.0	1.9	1.3
5	.....	2.6	.....	.....	.....	1.6	.9	1.1	1.8	1.3
6	.....	2.4	.....	.....	.....	1.7	.8	1.1	1.8	.9
7	.....	2.4	.....	8.2	.....	2.0	.7	1.2	1.8	.7
8	.....	2.6	.....	.....	4.7	1.9	.6	1.3	1.9	.8
9	.....	2.8	.....	.....	4.7	1.9	.4	1.4	1.9	.9
10	.....	3.0	.....	7.8	4.3	1.8	.4	1.5	1.9	1.1
11	.....	3.0	.....	.....	4.0	1.7	.4	1.6	1.9	.8
12	.....	2.8	.....	.....	3.8	1.5	.4	1.7	1.8	.9
13	.....	2.6	.....	.....	3.4	1.5	.4	1.7	1.8	.9
14	.....	2.8	.....	.....	2.8	1.5	.5	1.8	1.8	1.0
15	.....	3.2	4.9	.....	2.6	1.5	.6	1.9	1.7	1.1
16	1.0	3.3	.....	.....	2.4	1.5	.6	2.1	.....	1.1
17	.9	3.4	.....	.....	2.0	1.5	.7	2.2	1.7	1.1
18	.9	3.4	.....	.....	1.6	1.5	.7	2.4	1.7	1.0
19	.9	3.5	.....	.....	1.3	1.5	.8	2.2	1.7	.9
20	1.0	3.7	.....	.....	1.1	1.4	.8	2.2	1.5	.9
21	1.0	4.0	.....	.....	1.0	1.4	.9	2.2	1.2	.8
22	1.0	4.0	.....	.....	1.0	1.4	1.0	2.1	1.1	.7
23	1.0	4.0	.....	.....	1.1	1.4	1.1	2.1	1.1	.7
24	.9	4.0	.....	.....	1.1	1.4	1.2	2.0	1.2	.6
25	.7	3.8	.....	.....	1.1	1.4	1.1	2.0	1.2	.6
26	1.1	3.7	.....	4.2	1.1	1.5	1.1	1.9	1.2	.6
27	1.1	.....	.....	4.5	1.2	1.5	1.1	1.9	1.3	.7
28	1.1	3.4	.....	4.7	1.4	1.5	1.0	1.9	1.4	.7
29	1.2	.....	.....	5.0	1.4	1.4	.9	1.8	1.4	.7
30	1.4	.....	.....	5.2	1.2	1.4	.8	1.8	1.4	.7
31	1.9	.....	.....	.....	1.1	1.4	.....	1.7	.....	.7

Daily discharge, in second-feet, of Missouri River at Fort Benton, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	10,000	.....	.....	.....	5,650	6,350	5,000	8,100	6,700
2	.....	11,600	.....	.....	.....	5,650	6,350	5,000	8,100	6,700
3	.....	12,100	.....	.....	.....	5,650	5,650	5,000	8,450	6,700
4	.....	10,000	.....	.....	.....	5,650	5,300	5,300	8,450	6,350
5	.....	11,200	.....	.....	.....	7,400	5,000	5,650	8,100	6,350
6	.....	10,400	.....	.....	.....	7,750	4,750	5,650	8,100	5,000
7	.....	10,400	.....	43,900	.....	8,800	4,500	6,000	8,100	4,500
8	.....	11,200	.....	.....	21,800	8,450	4,250	6,350	8,450	4,750
9	.....	12,100	.....	.....	21,800	8,450	3,750	6,700	8,450	5,000
10	.....	13,000	.....	41,100	19,600	8,100	3,750	7,050	8,450	5,650
11	.....	13,000	.....	.....	18,000	7,750	3,750	7,400	8,450	4,750
12	.....	12,100	.....	.....	17,000	7,050	3,750	7,750	8,100	5,000
13	.....	11,200	.....	.....	15,000	7,050	3,750	7,750	8,100	5,000
14	.....	12,100	.....	.....	12,100	7,050	4,000	8,100	8,100	5,300
15	.....	14,000	22,900	.....	11,200	7,050	4,250	8,450	7,750	5,650
16	5,300	14,500	.....	.....	10,400	7,050	4,250	9,200	7,750	5,650
17	5,000	15,000	.....	.....	8,800	7,050	4,500	9,600	7,750	5,650
18	5,000	15,000	.....	.....	7,400	7,050	4,500	10,400	7,750	5,300
19	5,000	15,500	.....	.....	6,350	7,050	4,750	9,600	7,750	5,000
20	5,300	16,500	.....	.....	5,650	6,700	4,750	9,600	7,050	5,000
21	5,300	18,000	.....	.....	5,300	6,700	5,000	9,600	6,000	4,750
22	5,300	18,000	.....	.....	5,300	6,700	5,300	9,200	5,650	4,500
23	5,300	18,000	.....	.....	5,650	6,700	5,650	9,200	5,650	4,500
24	5,000	18,000	.....	.....	5,650	6,700	6,000	8,800	6,000	4,250
25	4,500	17,000	.....	.....	5,650	6,700	5,650	8,800	6,000	4,250
26	5,650	16,500	.....	19,000	5,650	7,050	5,650	8,450	6,000	4,250
27	5,650	15,800	.....	20,600	6,000	7,050	5,650	8,450	6,350	4,500
28	5,650	15,000	.....	21,800	6,700	7,050	5,300	8,450	6,700	4,500
29	6,000	15,000	.....	23,500	6,700	6,700	5,000	8,100	6,700	4,500
30	6,700	15,000	.....	24,700	6,000	6,700	4,750	8,100	6,700	4,500
31	8,450	.....	.....	.....	5,650	6,700	.....	7,750	.....	4,500

NOTE.—Daily discharge determined from a rating curve, which is fairly well defined throughout. Discharge estimated, by comparison with records of flow at Cascade station, as follows: Apr. 29 to May 10, 15,000 second-feet; May 11 to 14, 20,000 second-feet; May 16 to 26, 21,000 second-feet; May 27 to 31, 30,000 second-feet; June 1 to 6, 45,000 second-feet; June 11 to 20, 40,000 second-feet; June 21 to 25, 25,000 second-feet; July 1 to 7, 23,000 second-feet.

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Monthly discharge of Missouri River at Fort Benton, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March	8,450	4,500	5,570	177,000	B.
April	18,000	10,000	13,900	827,000	B.
May	.....	.....	20,400	1,250,000	D.
June	.....	.....	35,800	2,130,000	D.
July	.....	5,300	12,900	793,000	B.
August	8,800	5,650	7,000	430,000	B.
September	6,350	3,750	4,860	289,000	B.
October	10,400	5,000	7,760	477,000	B.
November	8,450	5,650	7,440	443,000	B.
December	6,700	4,250	5,130	315,000	B.
The period	.....	.....	.....	7,130,000	

NOTE.—See footnote to table of daily discharge.

PASSAMARI RIVER BASIN.

PASSAMARI RIVER [1] NEAR ALDER, MONT.

Location.—At the private bridge on Lauterbach's ranch, about 8 miles south of Alder, Mont.

Records available.—April 27, 1911, to December 31, 1913.

Drainage area.—About 540 square miles.

Gage.—Vertical staff spiked to bridge pile 4 feet from right bank.

Control.—Slightly shifting. Bed of stream below the gage composed of gravel and pebbles. At the gage the water is deeper and the material of the bed is finer.

Discharge measurements.—At low and ordinary stages made by wading on riffle at control 200 feet below gage; high-stage measurements made from downstream side of bridge.

Winter flow.—Affected by ice.

Discharge measurements of Passamari River near Alder, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 5	C. S. Heidel	4.50	243
June 21	.....do	4.80	317
Aug. 9	.....do	4.50	203
Oct. 8	.....do	4.30	194

[1] Called Ruby River in previous reports.

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Daily gage height in feet, of Passamari River near Alder, Mont., for 1913.

[Leo Hadel, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	5.3	4.6	4.1	.....	4.2	4.1
2	.....	.....	5.3	4.6	4.1	.....	4.3	4.1
3	.....	.....	5.2	4.6	4.1	.....	4.25	4.1
4	.....	.....	5.1	4.6	4.1	.....	4.3	4.1
5	4.5	.....	5.0	4.6	4.1	.....	4.3	4.0
6	4.55	.....	4.95	4.5	4.1	.....	4.3	4.0
7	4.7	.....	4.9	4.45	4.0	.....	4.3	.....
8	5.2	.....	4.85	4.45	4.1	.....	4.3	.....
9	5.5	.....	4.8	4.45	4.1	.....	4.2	.....
10	.....	.....	4.8	4.5	4.0	.....	4.15	.....
11	5.6	.....	4.75	4.45	4.0	.....	4.15	.....
12	5.5	.....	4.7	4.45	4.0	.....	4.15	.....
13	5.8	.....	4.65	4.45	4.0	.....	4.15	.....
14	5.4	.....	4.6	4.4	4.0	.....	4.15	.....
15	.....	.....	4.6	4.4	4.0	.....	4.15	.....
16	.....	.....	4.5	4.4	4.0	.....	4.2	.....
17	.....	.....	4.45	4.4	4.0	.....	4.2	.....
18	.....	.....	4.4	4.35	4.0	.....	4.2	.....
19	.....	.....	4.4	4.3	4.0	4.2	4.2	.....
20	.....	.....	4.4	4.3	4.0	4.2	4.15	.....
21	.....	.....	4.4	4.2	4.0	4.2	4.1	.....
22	.....	4.8	4.5	4.2	4.1	4.2	4.1	.....
23	.....	4.8	4.5	4.2	4.1	4.2	4.1	.....
24	.....	5.0	4.5	4.2	4.1	4.2	4.1	.....
25	.....	5.1	4.6	4.1	4.2	4.2	4.1	.....
26	.....	5.1	4.7	4.0	4.1	4.2	4.1	.....
27	.....	5.4	4.6	4.0	4.1	4.2	4.1	.....
28	.....	5.5	4.6	4.0	4.1	4.2	4.1	.....
29	.....	5.4	4.7	3.9	4.1	4.2	4.1	.....
30	.....	5.4	4.9	4.0	4.1	4.2	4.1	.....
31	.....	.....	4.7	4.1	.....	4.2	.....	.....

NOTE.—No observer available May 15 to June 21 and Oct. 1 to 18.

Daily discharge, in second-feet, of Passamari River near Alder, Mont., for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	490	230	105	.....	192	166
2	.....	.....	490	230	105	.....	219	166
3	.....	.....	455	230	105	.....	206	166
4	.....	.....	420	230	105	.....	219	166
5	277	.....	385	230	105	.....	219	141
6	292	.....	368	200	105	.....	219	141
7	340	.....	350	188	85	.....	219	.....
8	507	.....	334	188	105	.....	219	.....
9	615	.....	317	188	105	.....	192	.....
10	636	.....	317	200	85	.....	179	.....
11	652	.....	300	188	85	.....	179	.....
12	615	.....	284	188	85	.....	179	.....
13	726	.....	269	188	85	.....	179	.....
14	579	.....	250	175	85	.....	179	.....
15	.....	.....	249	175	85	.....	179	.....
16	.....	.....	216	175	85	.....	192	.....
17	.....	.....	200	175	85	.....	192	.....
18	.....	.....	187	162	85	.....	192	.....
19	.....	.....	184	150	85	192	192	.....
20	.....	.....	182	150	85	192	179	.....
21	.....	.....	180	127	85	192	166	.....
22	.....	317	205	127	105	192	166	.....
23	.....	317	204	127	105	192	166	.....
24	.....	385	203	127	105	192	166	.....
25	.....	420	231	105	127	192	166	.....
26	.....	420	260	85	105	192	166	.....
27	.....	530	230	85	105	192	166	.....
28	.....	570	230	85	105	192	166	.....
29	.....	530	260	65	105	192	166	.....
30	.....	530	325	85	105	192	166	.....
31	.....	.....	260	105	.....	192	.....	.....

NOTE.—Discharge determined from three fairly well defined rating curves applicable as follows: Jan. 1 to May 15 and after Oct. 8, June 21 to July 10, and July 26 to Sept. 30. Indirect method for shifting channels used July 11 to 25. Discharge estimated Oct. 1 to 18 at 170 second-feet.

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Monthly discharge of Passamari River near Alder, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
June 22–30	570	317	447	7,980	B.
July	490	180	285	17,500	C.
August	230	65	160	9,840	B.
September	127	85	97.1	5,780	B.
October			179	11,000	C.
November	219	166	186	11,100	B.
December 1–6	166	141	159	1,890	B.
The period				65,100	

BIGHOLE RIVER BASIN.

BIGHOLE RIVER NEAR DEWEY, MONT.

Location.—In sec. 36, T. 1 N., R. 11 W., at Young's bridge, 4 miles above Dewey and 11 miles above Divide, Mont.; a few miles below the mouth of Wise River.

Records available.—September 15, 1911, to July 31, 1913, when station was discontinued.

Drainage area.—Not measured.

Gage.—Staff fastened to southeast piling of bridge on downstream side. This gage was washed out on April 16, 1913, and on May 2, 1913, a temporary staff gage was installed on the left abutment of the old bridge. The temporary gage was read May 2, 1913, to July 31, 1913.

Control.—Rocky and clean; nonshifting.

Discharge measurements.—Made from bridge.

Winter flow.—Affected by ice.

Diversions.—Water is diverted from this stream for irrigation.

Regulation.—A large hydroelectric power plant is in operation about 8 miles below the station.

The following discharge measurement was made by C. S. Heidel:

May 2, 1913: Gage height, 4.40 feet; discharge, 1,430 second-feet.

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Daily gage height, in feet, and discharge, in second-feet, of Bighole River near Dewey, Mont., for 1913.

[W. T. Neal, observer.]

Day.	Mar.		Apr.		May.		June.		July.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	2.5	350	.....	1,440	9.2	8,910	.....	3,940
2	.....	.....	2.5	350	4.4	1,440	9.0	8,550	.....	4,280
3	.....	.....	2.5	350	4.6	1,620	9.0	8,550	.....	4,610
4	.....	.....	2.5	350	4.4	1,440	8.8	8,190	7.0	4,950
5	.....	.....	2.55	370	4.2	1,280	8.6	7,830	6.8	4,590
6	.....	.....	2.6	390	4.2	1,280	8.6	7,830	6.2	3,600
7	.....	.....	2.8	470	4.6	1,620	8.4	7,470	6.2	3,600
8	.....	.....	2.8	470	5.4	2,460	8.4	7,470	6.4	3,920
9	.....	.....	2.85	492	6.2	3,600	8.4	7,470	6.2	3,600
10	.....	.....	3.0	560	6.6	4,250	8.4	7,470	5.8	3,020
11	.....	.....	3.1	605	6.8	4,590	8.6	7,830	5.4	2,460
12	.....	.....	3.4	755	6.8	4,590	9.4	9,270	5.0	2,000
13	.....	.....	4.4	1,440	6.8	4,590	10.4	11,100	5.0	2,000
14	2.3	280	4.9	1,900	6.8	4,590	9.6	9,630	4.8	1,810
15	2.45	332	5.4	2,460	6.6	4,250	8.6	7,830	4.7	1,720
16	2.25	265	.....	.....	6.2	3,600	8.2	7,110	4.6	1,620
17	2.2	250	.....	.....	6.2	3,600	7.7	6,210	4.6	1,620
18	2.3	280	.....	.....	6.0	3,300	7.4	5,670	4.4	1,440
19	2.3	280	.....	.....	5.6	2,740	.....	5,080	4.4	1,440
20	2.3	280	.....	.....	5.4	2,460	.....	4,480	4.2	1,280
21	2.2	250	.....	.....	5.6	2,740	.....	3,890	4.2	1,280
22	2.3	280	.....	.....	5.8	3,020	6.0	3,300	4.3	1,360
23	2.3	280	.....	.....	6.0	3,300	6.0	3,300	4.4	1,440
24	2.2	250	.....	.....	6.6	4,250	6.2	3,600	4.6	1,620
25	2.2	250	.....	.....	7.0	4,950	6.2	3,600	4.6	1,620
26	2.2	250	.....	.....	7.8	6,390	6.2	3,600	4.8	1,810
27	2.2	250	.....	.....	8.2	7,110	6.8	4,590	4.9	1,900
28	2.3	280	.....	.....	9.2	8,910	7.2	5,310	5.0	2,000
29	2.3	280	.....	.....	9.8	9,990	6.8	4,590	4.8	1,810
30	2.45	332	.....	.....	9.8	9,990	6.2	3,600	4.6	1,620
31	2.45	332	.....	.....	9.4	9,270	.....	.....	4.6	1,620

NOTE.—Bridge and gage destroyed by high water Apr. 16, 1913. On May 2, when the station was visited, it was found that the bench marks had been destroyed by a construction crew. A temporary staff gage was installed on the left abutment of the old bridge. The discharge measurement referred to this gage plotted 3.25 feet too low on the station gage height scale. The channel at this station being permanent, it was assumed that the temporary gage read 3.25 feet too low, and all readings made on this gage have been increased by that amount. The temporary gage was read May 2 to July 31, when the station was discontinued. Daily discharge was determined from the rating curve for 1910 to 1912 which was well defined for those years and for 1913 to April 15 and fairly well defined after April 15, on account of the method of correcting gage heights.

Monthly discharge of Bighole River near Dewey, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 14–31	332	250	278	9,930	A.
April 1–15	2,460	350	754	22,400	A.
May	9,990	1,280	4,150	255,000	B.
June	11,100	3,300	6,440	383,000	B.
July	4,950	1,280	2,440	150,000	B.

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BOULDER RIVER BASIN.

MUSKRAT CREEK NEAR BOULDER, MONT.

Location.—In sec. 6, T. 6 N., R. 3 W., 1,000 feet above Boulder Nursery, near Boulder, Mont.

Records available.—April 27 to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff gage fastened to a flume 2.5 feet upstream from crest of weir. Gage heights give the head on the weir.

Control.—Flume.

Discharge measurements.—Flow measured by a sharp-crested weir 4.85 feet long with end contractions. Discharge computed by Francis formula, correcting for end contractions and velocity of approach.

Winter flow.—Affected by ice.

Regulation.—No regulation or diversion above the station.

Accuracy.—Results should be good.

Daily gage height, in feet, of Muskrat Creek near Boulder, Mont., for 1913.

[C. O. Hansen, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	0.22	0.18	0.15	0.13	0.34	1.22	0.63	0.36	0.22	0.24
2	.22	.17	.14	.13	.32	1.22	.71	.36	.22	.24
3	.22	.17	.14	.13	.33	1.22	.66	.35	.21	.24
4	.22	.17	.15	.13	.30	1.20	.....	.34	.21	.22
5	.21	.17	.14	.15	.31	1.02	.62	.33	.20	.20
6	.21	.17	.14	.15	.33	.99	.59	.32	.20	.24
7	.21	.17	.14	.16	.42	.97	.57	.32	.20	.27
8	.21	.15	.15	.16	.50	.98	.55	.34	.20	.34
9	.20	.15	.16	.18	.63	.98	.53	.36	.20	.40
10	.20	.16	.16	.23	.66	.96	.53	.36	.19	.40
11	.20	.15	.14	.30	.62	1.48	.50	.36	.18	.38
12	.20	.15	.14	.34	.52	1.10	.47	.34	.18	.36
13	.20	.15	.14	.38	.51	1.08	.44	.33	.18	.35
14	.20	.16	.14	.33	.46	.98	.44	.32	.18	.33
15	.20	.16	.14	.36	.44	.94	.42	.31	.18	.....
16	.20	.16	.15	.32	.42	.81	.43	.30	.18	.....
17	.20	.15	.15	.38	.40	.....	.40	.29	.18	.....
18	.19	.15	.14	.41	.42	.75	.40	.28	.18	.....
19	.19	.15	.14	.44	.42	.76	.39	.27	.20	.....
20	.19	.15	.14	.42	.43	.72	.38	.26	.21	.....
21	.19	.15	.14	.43	.41	.66	.40	.25	.20	.....
22	.18	.15	.14	.....	.46	.66	.46	.25	.20	.....
23	.18	.15	.14	.....	.55	.64	.42	.24	.22	.....
24	.18	.15	.13	.....	.71	.65	.40	.23	.24	.....
25	.18	.15	.13	.30	.77	.76	.38	.23	.27	.....
26	.18	.15	.13	.32	1.01	.82	.56	.22	.27	.....
27	.18	.15	.13	.38	1.28	.76	.46	.22	.26	.....
28	.18	.15	.14	.42	1.42	.65	.42	.22	.26	.....
29	.18	.....	.14	.35	1.38	.62	.41	.22	.26	.....
30	.18	.....	.14	.32	1.24	.63	.40	.22	.25	.....
31	.18	.....	.16	.....	1.22	.....	.38	.22	.....	.....

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Daily discharge, in second-feet, of Muskrat Creek near Boulder, Mont., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	1.6	1.2	1.0	0.8	3.2	21.8	8.4	3.5	1.6	1.9
2	1.6	1.1	.9	.8	2.9	21.8	10.0	3.5	1.6	1.9
3	1.6	1.1	.9	.8	3.0	21.8	9.0	3.4	1.5	1.9
4	1.6	1.1	1.0	.8	2.6	21.3	8.6	3.2	1.5	1.6
5	1.5	1.1	.9	1.0	2.8	16.9	8.2	3.0	1.4	1.4
6	1.5	1.1	.9	1.0	3.0	16.2	7.6	2.9	1.4	1.9
7	1.5	1.1	.9	1.0	4.5	15.7	7.2	2.9	1.4	2.2
8	1.5	1.0	1.0	1.0	5.9	15.9	6.8	3.2	1.4	3.2
9	1.4	1.0	1.0	1.2	8.4	15.9	6.5	3.5	1.4	4.1
10	1.4	1.0	1.0	1.8	9.0	15.5	6.5	3.5	1.3	4.1
11	1.4	1.0	.9	2.6	8.2	29.2	5.9	3.5	1.2	3.8
12	1.4	1.0	.9	3.2	6.3	18.8	5.4	3.2	1.2	3.5
13	1.4	1.0	.9	3.8	6.1	18.3	4.8	3.0	1.2	3.4
14	1.4	1.0	.9	3.0	5.2	15.9	4.8	2.9	1.2	3.0
15	1.4	1.0	.9	3.5	4.8	15.0	4.5	2.8	1.2	.....
16	1.4	1.0	1.0	2.9	4.5	12.1	4.6	2.6	1.2	.....
17	1.4	1.0	1.0	3.8	4.1	11.4	4.1	2.5	1.2	.....
18	1.3	1.0	.9	4.3	4.5	10.8	4.1	2.4	1.2	.....
19	1.3	1.0	.9	4.8	4.5	11.1	4.0	2.2	1.4	.....
20	1.3	1.0	.9	4.5	4.6	10.2	3.8	2.1	1.5	.....
21	1.3	1.0	.9	4.6	4.3	9.0	4.1	2.0	1.4	.....
22	1.2	1.0	.9	4.1	5.2	9.0	5.2	2.0	1.4	.....
23	1.2	1.0	.9	3.6	6.8	8.6	4.5	1.9	1.6	.....
24	1.2	1.0	.8	3.1	10.0	8.8	4.1	1.8	1.9	.....
25	1.2	1.0	.8	2.6	11.3	11.1	3.8	1.8	2.2	.....
26	1.2	1.0	.8	2.9	16.6	12.3	7.0	1.6	2.2	.....
27	1.2	1.0	.8	3.8	23.5	11.1	5.2	1.6	2.1	.....
28	1.2	1.0	.9	4.5	27.4	8.8	4.5	1.6	2.1	.....
29	1.2	.....	.9	3.4	26.2	8.2	4.3	1.6	2.1	.....
30	1.2	.....	.9	2.9	22.4	8.4	4.1	1.6	2.0	.....
31	1.2	.....	1.0	.....	21.8	.....	3.8	1.6	.....	.....

NOTE.—Discharge determined from a rating table computed from Francis's formula, correcting for end contractions and velocity of approach; uncertainty as to the velocity of approach reduces the accuracy.

Monthly discharge of Muskrat Creek near Boulder, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	1.6	1.2	1.36	83.6	C.
February	1.2	1.0	1.03	57.2	C.
March	1.0	.8	.91	56.0	C.
April	4.8	.8	2.74	163	B.
May	27.4	2.6	8.83	543	B.
June	29.2	8.2	14.4	857	B.
July	10.0	3.8	5.66	348	B.
August	3.5	1.6	2.55	157	B.
September	2.2	1.2	1.53	91.0	B.
October 1–14	4.1	1.4	2.71	75.2	B.
The period	.....	.....	.....	2,430	

NOTE.—Accuracy for January, February, and March reduced on account of the possibility of ice being present.

MADISON RIVER BASIN.

MADISON RIVER NEAR YELLOWSTONE, MONT.

Location.—In sec. 5, T. 14 S., R. 6 W. Montana meridian, at Riverside soldier station in the Yellowstone National Park, at the crossing of the stage road about 4 miles east of Yellowstone, Mont.

Records available.—June 16 to December 31, 1913.

Drainage area.—410 square miles (measured on topographic sheets).

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Gage.—Vertical staff gage with bronze sections, braced to pine tree on left bank about 100 yards north of the road to west boundary of the park. Almost directly opposite the soldier station.

Control.—Probably fairly permanent. Bottom rough; grass and weeds may become troublesome in summer time. One channel at all stages.

Discharge measurements.—Made by wading at most stages; at high stages could be made from footbridge 250 feet upstream.

Winter flow.—Discharge relation apparently little affected by ice.

Cooperation.—Gage-height records and transportation within the park furnished by the Yellowstone National Park authorities.

Discharge measurements of Madison River near Yellowstone, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
June 16	G. C. Baldwin	2.05	1,220
23	....do	1.86	953
Sept. 8	R. C. Pierce	1.56	695
15	....do	1.54	695

Daily gage height, in feet, of Madison River near Yellowstone, Mont., for 1913.

[Bohen and Rowe, observers.]

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.85	1.9	1.55	1.5	1.55	1.5
2	.....	1.85	1.85	1.6	1.5	1.55	1.5
3	.....	1.9	1.75	1.65	1.5	1.6	1.5
4	.....	1.85	1.7	1.65	1.5	1.6	1.5
5	.....	1.85	1.7	1.6	1.55	1.65	1.45
6	.....	1.85	1.7	1.6	1.6	1.6	1.45
7	.....	1.7	1.7	1.6	1.6	1.6	1.45
8	.....	1.65	1.65	1.6	1.65	1.55	1.45
9	.....	1.65	1.7	1.6	1.65	1.55	1.45
10	.....	1.7	1.7	1.6	1.7	1.55	1.45
11	.....	1.7	1.65	1.6	1.7	1.6	1.45
12	.....	1.7	1.6	1.6	1.65	1.6	1.45
13	.....	1.65	1.6	1.6	1.65	1.6	1.45
14	.....	1.6	1.6	1.6	1.6	1.6	1.45
15	.....	1.6	1.6	1.6	1.6	1.6	1.45
16	2.05	1.6	1.6	1.55	1.6	1.55	1.45
17	2.05	1.6	1.6	1.5	1.55	1.55	1.45
18	2.0	1.55	1.6	1.5	1.55	1.55	1.45
19	2.0	1.55	1.6	1.5	1.55	1.6	1.45
20	1.95	1.55	1.6	1.5	1.6	1.6	1.45
21	1.9	1.55	1.6	1.5	1.6	1.6	1.4
22	1.85	1.8	1.6	1.65	1.55	1.6	1.45
23	1.85	1.8	1.55	1.6	1.55	1.55	1.45
24	1.85	1.85	1.55	1.6	1.55	1.55	1.45
25	1.9	2.2	1.55	1.6	1.55	1.5	1.45
26	1.9	1.9	1.55	1.55	1.55	1.5	1.4
27	1.9	1.85	1.55	1.55	1.55	1.5	1.4
28	1.9	1.95	1.55	1.55	1.6	1.55	1.4
29	1.85	2.1	1.55	1.55	1.6	1.55	1.4
30	1.9	2.4	1.55	1.5	1.6	1.55	1.4
31	.....	2.1	1.6	.....	1.55	.....	1.4

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Daily discharge, in second-feet, of Madison River near Yellowstone, Mont., for 1913.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	974	1,020	681	635	681	635
2	.....	974	974	727	635	681	635
3	.....	1,020	872	775	635	727	635
4	.....	974	823	775	635	727	635
5	.....	974	823	727	681	775	590
6	.....	974	823	727	727	727	590
7	.....	823	823	727	727	727	590
8	.....	775	775	727	775	681	590
9	.....	775	823	727	775	681	590
10	.....	823	823	727	823	681	590
11	.....	823	775	727	823	727	590
12	.....	823	727	727	775	727	590
13	.....	775	727	727	775	727	590
14	.....	727	727	727	727	727	590
15	.....	727	727	727	727	727	590
16	1,180	727	727	681	727	681	590
17	1,180	727	727	635	681	681	590
18	1,130	681	727	635	681	681	590
19	1,130	681	727	635	681	727	590
20	1,080	681	727	635	727	727	590
21	1,020	681	727	635	727	727	546
22	974	922	727	775	681	727	590
23	974	922	681	727	681	681	590
24	974	974	681	727	681	681	590
25	1,020	1,350	681	727	681	635	590
26	1,020	1,020	681	681	681	635	546
27	1,020	974	681	681	681	635	546
28	1,020	1,080	681	681	727	681	546
29	974	1,240	681	681	727	681	546
30	1,020	1,570	681	635	727	681	546
31	.....	1,240	727	.....	681	.....	546

NOTE.—Discharge determined from a rating curve fairly well defined for observed range of stage.

Monthly discharge of Madison River near Yellowstone, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
June 16–30	1,180	974	1,050	31,200	B.
July	1,570	681	917	56,400	B.
August	1,020	681	759	46,700	B.
September	775	635	704	41,900	B.
October	823	635	711	43,700	B.
November	775	635	699	41,600	B.
December	635	546	586	36,000	B.
The period	.....	.....	.....	298,000	

GIBBON RIVER NEAR YELLOWSTONE, MONT.

Location.—In sec. 6, T. 14 S., R. 8 E. Montana meridian, at the Wylie Gibbon lunch station in Yellowstone National Park, about 2 miles below Gibbon Falls.

Records available.—June 22 to December 31, 1913.

Drainage area.—117 square miles (measured on topographic sheets).

Gage.—Original gage a vertical staff on the downstream abutment of highway bridge was removed August 29 during construction of a new bridge. Temporary gage read until September 14, when a new vertical staff was installed on the left bank about 40 feet below original site.

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Control.—Composed of gravel, which may shift at times. One channel at all stages.
Discharge measurements.—Made by wading.
Cooperation.—Gage heights are furnished by employees of the Wylie Co. during the tourist season and by soldiers stationed in the park during the winter. Transportation is furnished by the park authorities.

Discharge measurements of Gibbon River near Yellowstone, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
June 22	G. C. Baldwin	a 2.90	253
Sept. 8	R. C. Pierce	1.74	131
14	....do	1.70	126

a Old gage which bears no determined relation to new gage used after Aug. 30.

Daily gage height, in feet, of Gibbon River near Yellowstone, Mont., for 1913.

[Vetter and Hood, observers.]

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.9	2.8	1.7	.....	.....	.....	16	.....	2.5	2.45	.....	.....	1.65	.....
2	.....	3.05	2.7	1.7	1.7	.....	.....	17	.....	2.5	2.45	.....	1.6	.....	.....
3	.....	3.0	.....	1.8	.....	.....	.....	18	.....	2.5	2.45	.....	.....	.....	1.55
4	.....	2.9	2.7	1.7	.....	.....	.....	19	.....	2.5	2.4	.....	.....	.....	.....
5	.....	2.8	2.6	1.7	.....	.....	1.65	20	.....	2.6	2.4	.....	1.7	.....	.....
6	.....	2.8	2.6	1.7	.....	1.7	.....	21	.....	2.65	2.4	.....	.....	.....	.....
7	.....	2.7	.....	1.7	.....	.....	.....	22	2.9	2.75	2.4	.....	.....	.....	.....
8	.....	2.65	2.6	1.7	.....	.....	.....	23	2.9	2.6	2.4	.....	.....	1.6	1.5
9	.....	2.6	.....	1.8	1.8	.....	.....	24	3.0	2.7	2.4	.....	.....	.....	.....
10	.....	2.65	2.6	1.7	.....	.....	.....	25	3.0	2.75	2.4	.....	.....	.....	.....
11	.....	2.65	2.6	1.7	.....	.....	1.55	26	3.0	2.8	2.4	.....	.....	.....	.....
12	.....	2.6	2.6	1.7	.....	1.7	.....	27	3.0	2.75	2.4	.....	.....	.....	1.5
13	.....	2.6	2.5	1.7	.....	.....	.....	28	3.0	2.85	2.35	.....	.....	.....	.....
14	.....	2.6	2.5	1.7	.....	.....	.....	29	3.0	3.1	2.4	.....	.....	.....	.....
15	.....	2.55	2.5	.....	.....	.....	.....	30	2.95	3.6	.....	.....	1.75	1.65	.....
								31	.....	3.1	1.7	.....	.....	.....	.....

NOTE.—Gage heights June 22 to Aug. 29 read on original gage. Readings Aug. 31 to Dec. 31 have been reduced to datum of new gage installed Sept. 14.

Daily discharge, in second-feet, of Gibbon River near Yellowstone, Mont., for 1913.

Day.	June.	July.	Aug.	Day.	June.	July.	Aug.	Day.	June.	July.	Aug.
1	.....	253	227	11	.....	188	176	21	.....	188	130
2	.....	294	201	12	.....	176	176	22	253	214	130
3	.....	280	201	13	.....	176	152	23	253	176	130
4	.....	253	201	14	.....	176	152	24	280	201	130
5	.....	227	176	15	.....	164	152	25	280	214	130
6	.....	227	176	16	.....	152	141	26	280	227	130
7	.....	201	176	17	.....	152	141	27	280	214	130
8	.....	188	176	18	.....	152	141	28	280	210	130
9	.....	176	176	19	.....	152	130	29	280	308	130
10	.....	188	176	20	.....	176	130	30	266	454	128
								31	.....	308	126

NOTE.—Discharge June 22 to Aug. 31 computed from a section of rating curve constructed for the range of gage heights from three current-meter measurements. Range was not great, so the results should be fairly accurate. Measurements connected with new gage insufficient to warrant discharge estimates.

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Monthly discharge of Gibbon River near Yellowstone, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
June 22-30	280	253	272	4,860	B.
July	454	152	216	13,300	C.
August	227	120	155	9,530	C.

NOTE.—Monthly estimates Sept. 1 to Dec. 31 not prepared, as the section of the stream at the new gage has not been rated.

GALLATIN RIVER BASIN.

WEST GALLATIN RIVER NEAR SALESVILLE, MONT.

Location.—On highway bridge 4 miles above Salesville, Mont., just below mouth of canyon. Above the station Spanish Creek is the most important tributary.

Records available.—July 18, 1895, to December 31, 1905; August 9, 1910, to July 31, 1913, when station was discontinued.

Drainage area.—860 square miles.

Gage.—Standard chain, boxed and fastened near middle of bridge on upstream side.

Control.—Bed of stream is of gravel and small bowlders; will not shift.

Discharge measurements.—Made from lower side of the highway bridge.

Diversions.—Irrigation is practiced extensively on this stream, and practically the entire low-water flow of the river is appropriated.

Daily gage height, in feet, and discharge, in second-feet, of West Gallatin River near Salesville, Mont., for 1913.

[C. L. Crew, observer.]

Day.	April.		May.		June.		July.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	3.0	335	3.9	880	7.4	6,220	5.3	2,550
2	3.0	335	3.7	725	7.3	6,040	5.2	2,400
3	2.9	295	3.5	590	7.3	6,040	5.2	2,400
4	3.2	425	3.6	655	7.3	6,040	5.2	2,400
5	3.2	425	3.6	655	7.2	5,860	5.0	2,100
6	3.1	380	3.6	655	7.1	5,680	5.0	2,100
7	3.2	425	3.9	880	7.0	5,500	4.9	1,960
8	3.3	475	4.3	1,240	6.8	5,140	4.8	1,830
9	3.2	425	4.6	1,570	6.9	5,320	4.8	1,830
10	3.4	530	4.9	1,960	6.9	5,320	4.8	1,830
11	3.4	530	5.0	2,100	6.6	4,780	4.6	1,570
12	3.4	530	4.9	1,960	6.6	4,780	4.6	1,570
13	3.5	590	4.9	1,960	6.6	4,780	4.5	1,450
14	3.6	655	4.7	1,700	6.3	4,240	4.3	1,240
15	3.5	590	4.5	1,450	6.3	4,240	4.3	1,240
16	3.6	655	4.3	1,240	6.2	4,060	4.2	1,140
17	3.7	725	4.3	1,240	6.0	3,700	4.0	965
18	3.6	655	4.2	1,140	6.1	3,880	4.0	965
19	3.7	725	4.5	1,450	5.9	3,520	3.9	880
20	3.6	655	4.5	1,450	5.5	2,850	3.9	880
21	3.5	590	3.9	880	5.5	2,850	4.2	1,140
22	3.6	655	4.6	1,570	5.5	2,850	4.2	1,140
23	3.5	590	5.2	2,400	5.4	2,700	4.1	1,060
24	3.4	530	6.1	3,880	5.5	2,850	4.3	1,240
25	3.4	530	6.4	4,420	5.5	2,850	4.2	1,140
26	3.4	530	6.4	4,420	5.4	2,700	4.1	1,060
27	3.5	590	7.1	5,680	5.8	3,350	4.1	1,060
28	3.9	880	7.8	6,940	5.8	3,350	4.1	1,060
29	3.9	880	7.6	6,580	5.6	3,010	4.5	1,450
30	4.1	1,060	7.5	6,400	5.4	2,700	4.5	1,450
31			7.4	6,220				1,450

NOTE.—No discharge measurements made in 1913. Discharge determined from rating curve for 1912, which was fairly well defined for that year but uncertain for 1913.

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Monthly discharge of West Gallatin River near Salesville, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	1,060	295	573	34,100	C.
May	6,940	590	2,420	149,000	C.
June	6,220	2,700	4,240	252,000	C.
July	2,550	880	1,500	92,200	C.

CROW CREEK BASIN.

CROW CREEK NEAR TOWNSEND, MONT.

Location.—In the SE. ¼ sec. 5, T. 6 N., R. 1 W., near the Eagle Creek ranger station, about 1,000 feet above the mouth of Eagle Creek, and about 10 miles west of Townsend.

Records available.—January 5, 1912, to December 31, 1913 (fragmentary).

Drainage area.—33 square miles.

Gage.—Vertical staff.

Control.—Gravel, irregular, and possibly shifting.

Discharge measurements.—Made by wading near the gage.

Winter flow.—Affected by ice.

Diversion.—Above this point water has been used and is used for placer mining; below this point the entire flow during the summer is used for placer work and irrigation.

No discharge measurements were made during 1913.

Daily gage height, in feet, of Crow Creek near Townsend, Mont., for 1913.

[Charles Larson, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	1.7	.....	.....	.....	.....	16	1.4	.....	.....	.....	.....	.....
2	.....	.....	.....	.....	.....	.....	17	.....	.....	.....	.....	.....	.....
3	.....	.....	.....	.....	.....	1.7	18	1.6	.....	.....	.....	.....	.....
4	.....	1.4	.....	.....	.....	.....	19	.....	.....	.....	1.7	.....	.....
5	.....	.....	.....	2.0	1.5	.....	20	.....	.....	.....	.....	.....	.....
6	.....	.....	.....	.....	.....	.....	21	.....	.....	.....	1.7	.....	.....
7	.....	.....	.....	.....	.....	1.6	22	.....	.....	.....	.....	.....	.....
8	.....	2.0	.....	.....	.....	.....	23	.....	.....	.....	.....	1.7	.....
9	.....	.....	.....	1.8	1.6	.....	24	.....	.....	.....	.....	1.7	.....
10	.....	.....	.....	.....	1.6	1.5	25	.....	2.8	.....	.....	.....	.....
11	.....	2.5	.....	.....	.....	.....	26	.....	3.6	.....	.....	.....	.....
12	.....	.....	.....	.....	.....	.....	27	.....	4.6	.....	.....	.....	.....
13	.....	2.1	.....	1.9	.....	.....	28	.....	.....	.....	1.6	.....	.....
14	.....	.....	.....	.....	1.6	1.6	29	.....	.....	.....	.....	1.6	.....
15	.....	.....	.....	.....	.....	.....	30	.....	.....	.....	.....	.....	.....
							31	.....	.....	.....	.....	.....	.....

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DEEP CREEK BASIN.

DEEP CREEK NEAR TOWNSEND, MONT.

Location.—In sec. 29, T. 7 N., R. 4 E., unsurveyed, 12 miles east of Townsend, directly back of the ranger station in the canyon of Deep Creek, approximately 10 miles above the confluence with the Missouri River.

Records available.—Gage heights, October 9, 1910, to December 31, 1913 (fragmentary).

Drainage area.—89 square miles.

Gage.—Vertical staff.

Control.—Small rock; probably permanent.

Discharge measurements.—Made by wading.

Winter flow.—Affected by ice.

Diversion.—Small quantities of water are diverted for irrigation on small flats above the gage. Below the gage nearly the entire flow is diverted or will eventually be diverted, for irrigation on the land adjoining this creek and Missouri River.

No discharge measurements were made during 1913.

Daily gage height, in feet, of Deep Creek near Townsend, Mont., for 1913.

[Evans and Bradeen, observers.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.3	1.95	1.35	1.1	0.8	0.8	0.8	.....
2	.....	1.3	2.0	1.48	1.1	.8	.8	.....	0.7
3	.....	1.2	1.85	1.40	1.1	.8	.....	.8	.....
4	.....	1.2	.....	1.4	1.1	.....	.....	.8	.....
5	.....	.....	.....	1.35	1.05	.....	.85	.8	.7
6	.....	.....	1.7	1.40	1.05	.....	.85	.8	.7
7	.....	1.2	1.7	1.38	1.05	.8	.85	.8	.....
8	.....	1.3	.....	1.35	1.05	.8	.85	.8	.7
9	.....	1.4	.....	1.35	1.05	.8	.8	.....	.....
10	.....	1.5	1.6	1.32	.....	.8	.8	.8	.....
11	.....	.....	1.6	1.30	1.0	.8	.85	.8	.....
12	0.9	.....	1.7	1.3	1.0	.8	.9	.....	.....
13	1.2	.....	1.7	1.3	1.0	.....	.9	.8	.....
14	1.6	.....	1.65	1.3	.....	.75	.9	.8	.....
15	1.6	.....	1.6	1.2	.....	.75	.....	.8	.....
16	1.3	.....	1.6	1.2	1.0	.....	.....	.8	.....
17	.....	.....	1.55	1.2	1.0	.75	.....	.8	.....
18	.....	.....	1.55	1.2	1.0	.75	.8	.8	.....
19	1.6	.....	1.60	1.15	.....	.75	.8	.....	.....
20	1.5	.....	1.52	1.1	.....	.75	.8	.8	.....
21	1.5	.....	1.50	1.1	.9	.75	.....	.8	.....
22	.....	.....	1.5	1.15	.9	.8	.....	.8	.....
23	.....	.....	1.45	1.1	.9	.8	.....	.....	.....
24	.....	2.1	1.45	1.05	.9	.8	.8	.8	.....
25	.....	2.0	1.5	1.1	.....	.8	.8	.8	.....
26	.....	2.1	.....	1.1	.....	.....	.8	.....	.....
27	1.4	2.45	.....	1.1	.....	.....	.....	.75	.....
28	1.4	2.5	1.4	1.1	.....	.....	.....	.....	.....
29	1.4	2.3	1.4	1.15	.8	.8	.....	.....	.....
30	1.3	2.05	1.4	1.12	.8	.8	.8	.....	.....
31	.....	2.0	.....	1.10	.8	.....	.8	.....	.....

NOTE.—Sufficient discharge measurements have not been obtained to define a rating curve.

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PRICKLY PEAR CREEK BASIN.

PRICKLY PEAR CREEK NEAR CLANCY, MONT.

Location.—In sec. 34, T. 9 N., R. 3 W., at private wagon bridge back of the ranch buildings on the Stafford ranch, about 1 mile below Clancy and just below the mouth of Lump Gulch Creek. This station was established to take the place of the one previously maintained about a mile below. The same amount of water passes both stations.

Records available.—July 15, 1908, to June 30, 1909 (old site); July 12, 1910, to December 31, 1913 (present site).

Drainage area.—Not measured.

Gage.—Staff, nailed to bridge abutment, right bank, on downstream side.

Discharge measurements.—Made from the wagon bridge or by wading.

Winter flow.—Ice is common in extreme cold weather.

Diversions.—Few diversions above station, but entire summer flow is appropriated and used for irrigation below station.

Discharge measurements of Prickly Pear Creek near Clancy, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Mar. 31	R. R. Randell	1.67	58
May 13	C. S. Heidel	2.31	154
Sept. 17	J. M. Ray	1.05	23

Daily gage height, in feet, of Prickly Pear Creek near Clancy, Mont., for 1913.

[J. J. Naab, jr., observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.8	2.6	2.15	1.3	1.0	1.25	1.7	1.25
2	.....	1.8	2.5	2.35	1.3	1.05	1.25	1.55	.....
3	.....	1.95	2.4	2.15	1.3	1.05	1.15	1.5	.....
4	.....	1.8	2.45	2.05	1.3	1.05	1.25	1.45	.....
5	.....	1.75	2.35	2.0	1.3	1.05	1.25	1.35	.....
6	2.15	1.7	2.15	1.9	1.25	1.1	1.25	1.35	.....
7	2.25	1.85	2.2	1.75	1.25	1.05	1.35	1.25	.....
8	.....	2.05	2.15	1.7	1.35	1.05	1.35	1.25	.....
9	.....	2.0	2.05	1.7	1.45	1.05	1.35	1.25	.....
10	.....	2.2	2.05	1.55	1.45	1.05	1.35	1.25	.....
11	1.65	2.25	3.5	1.6	1.45	1.1	1.3	1.25	.....
12	.....	2.15	3.75	1.4	1.45	1.05	1.45	1.25	.....
13	2.05	2.2	3.7	1.4	1.25	1.05	1.45	1.6	.....
14	1.95	2.15	2.6	1.3	1.2	1.05	1.45	1.35	.....
15	2.0	2.1	2.35	1.3	1.2	1.05	1.45	1.35	.....
16	1.8	2.1	2.25	1.3	1.2	1.1	1.35	1.3	.....
17	1.85	2.1	2.25	1.3	1.2	1.05	1.25	1.3	.....
18	2.0	2.1	2.25	1.2	1.2	1.05	1.25	1.3	.....
19	1.85	2.15	2.25	1.2	1.1	.95	1.25	1.25	.....
20	2.0	2.1	2.2	1.1	1.15	.95	1.25	1.15	.....
21	2.05	2.2	2.05	1.15	1.1	.95	1.35	1.05	.....
22	1.7	2.25	2.05	1.1	1.1	1.1	1.35	1.1	.....
23	2.15	2.25	2.05	1.15	1.1	1.15	1.3	1.15	.....
24	2.05	2.3	2.1	1.15	1.0	1.2	1.4	1.25	.....
25	1.95	2.45	2.05	1.2	1.1	1.25	1.45	1.25	.....
26	1.95	2.7	2.25	1.65	1.1	1.25	1.3	1.25	.....
27	2.05	3.0	2.4	1.5	1.1	1.25	1.35	1.3	.....
28	2.15	2.95	2.4	1.5	1.1	1.25	1.35	1.3	.....
29	2.0	3.05	2.05	1.4	1.0	1.25	1.35	1.25	.....
30	1.8	2.8	2.0	1.5	1.1	1.25	1.3	1.25	.....
31	.....	2.7	.....	1.45	1.1	.....	1.25	.....	.....

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Daily discharge, in second-feet, of Prickly Pear Creek near Clancy, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	72	207	130	40	21	36	75	36
2	.....	72	188	162	40	24	36	60	.....
3	.....	89	170	130	40	24	30	55	.....
4	.....	72	179	116	40	24	36	51	.....
5	.....	67	162	110	40	24	36	44	.....
6	115	62	130	97	36	27	36	44	.....
7	130	78	137	80	36	24	44	36	.....
8	112	105	130	75	44	24	44	36	.....
9	94	102	116	75	51	24	44	36	.....
10	76	130	116	60	51	24	44	36	.....
11	58	140	420	65	51	27	40	36	.....
12	80	128	238	47	51	24	51	36	.....
13	102	137	227	47	36	24	51	65	.....
14	89	130	207	40	33	24	51	44	.....
15	95	123	162	40	33	24	51	44	.....
16	72	123	145	40	33	27	44	40	.....
17	78	123	145	40	33	24	36	40	.....
18	95	123	145	33	33	24	36	40	.....
19	78	130	145	33	27	18	36	36	.....
20	95	123	137	27	30	18	36	30	.....
21	102	137	116	30	27	18	44	24	.....
22	62	145	116	27	27	27	44	27	.....
23	115	145	116	30	27	30	40	30	.....
24	102	153	123	30	21	33	47	36	.....
25	89	179	116	33	27	36	51	36	.....
26	89	227	145	70	27	36	40	36	.....
27	102	293	170	55	27	36	44	40	.....
28	115	282	170	55	27	36	44	40	.....
29	95	306	116	47	21	36	44	36	.....
30	72	248	110	55	27	36	40	36	.....
31	.....	227	.....	51	27	.....	36	.....	.....

NOTE.—Discharge determined as follows: Apr. 6 to May 7, from a poorly defined rating curve; May 8 to 12, by indirect method for shifting channels; May 13 to Dec. 1, from a poorly defined rating curve; Apr. 1 to 5, estimated at 90 second-feet; Apr. 8 to 10 and Apr. 12, interpolated; June 12 and 13, estimated from the flow at East Helena.

Monthly discharge of Prickly Pear Creek near Clancy, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	.....	a21	1,290	D.
February	.....	.....	a25	1,390	D.
March	.....	.....	a35	2,150	D.
April	.....	.....	92.1	5,480	C.
May	306	62	144	8,850	C.
June	420	110	160	9,520	C.
July	162	27	62.3	3,830	C.
August	51	21	34.3	2,110	C.
September	36	18	26.6	1,580	C.
October	51	30	41.7	2,560	C.
November	75	24	40.8	2,430	C.
December	.....	.....	a30	1,840	D.
The year	420	.....	59.5	43,000	

a Estimated.

PRICKLY PEAR CREEK AT EAST HELENA, MONT.

Location.—In the NE. ¼ sec. 36, T. 10 N., R. 3 E., at the point where the Northern Pacific Railway crosses the stream at East Helena, Mont. The only important tributaries entering Prickly Pear Creek above the station are McClellan and Lump Gulch creeks; Tenmile and Silver creeks come in below.

Records available.—July 18, 1908, to July 31, 1913, when station was discontinued.

Drainage area.—Not measured.

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Gage.—Staff fastened to piling on the Northern Pacific Railway bridge; datum unchanged.

Control.—Rocky, clean, and nonshifting.

Discharge measurements.—Made from a highway bridge near the railway bridge or by wading just below the gage.

Diversions.—All the normal flow of Prickly Pear Creek is used for irrigation, the greater part of the water being diverted below the station.

Accuracy.—The bed of the stream is so extremely rough that discharge measurements are difficult, even in low water. Fair results have, however, been obtained.

Discharge measurements of Prickly Pear Creek at East Helena, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Feb. 20	R. R. Randell.....	a 1.00	36	May 14	Heidel and Walker.....	1.70	187
Apr. 2	.....do.....	1.16	51	June 4	J. M. Ray.....	1.80	220
2	.....do.....	1.16	52	July 17	.....do.....	1.30	86

a Some ice on banks at gage.

Daily gage height, in feet, and discharge, in second-feet, of Prickly Pear Creek at East Helena, Mont., for 1913.

[R. T. Ray, observer.]

Day.	Mar.		April.		May.		June.		July.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	1.15	50	1.35	89	1.95	286	1.6	172
2	.....	.....	1.2	58	1.4	100	1.9	268	1.8	240
3	.....	.....	1.15	50	1.4	100	1.85	254	1.7	205
4	.....	.....	1.2	58	1.40	100	1.82	247	1.70	205
5	.....	.....	1.5	126	1.42	105	1.80	240	1.62	179
6	.....	.....	1.5	126	1.40	100	1.7	205	1.60	172
7	.....	.....	1.35	89	1.45	113	1.65	188	1.55	136
8	.....	.....	1.3	78	1.55	141	1.65	188	1.5	141
9	.....	.....	1.3	78	1.55	141	1.6	172	1.45	126
10	.....	.....	1.35	89	1.7	188	1.6	172	1.42	118
11	.....	.....	1.48	121	1.8	220	1.55	156	1.40	112
12	.....	.....	1.50	126	1.7	188	2.4	450	1.3	88
13	.....	.....	1.55	141	1.80	220	2.0	310	1.25	78
14	.....	.....	1.60	156	1.68	182	1.88	268	1.25	78
15	.....	.....	1.62	162	1.65	172	1.80	240	1.25	78
16	1.05	44	1.45	113	1.6	156	1.75	222	1.25	78
17	1.05	44	1.4	100	1.6	156	1.7	205	1.3	88
18	1.0	37	1.4	100	1.65	172	1.7	205	1.3	88
19	.....	.....	1.55	141	1.68	182	1.7	205	1.25	78
20	.....	.....	1.35	89	1.65	172	1.65	188	1.25	78
21	.....	.....	1.55	141	1.65	172	1.6	172	1.25	78
22	.....	.....	1.55	141	1.7	188	1.6	172	1.3	88
23	.....	.....	1.4	100	1.75	204	1.55	156	1.30	86
24	.....	.....	1.40	100	1.8	220	1.55	156	1.28	84
25	.....	.....	1.38	96	1.9	254	1.6	172	1.28	84
26	.....	.....	1.40	100	1.9	258	1.65	188	1.45	126
27	.....	.....	1.5	126	2.1	328	1.8	240	1.35	100
28	1.2	68	1.5	126	2.2	366	1.65	188	1.3	88
29	1.70	199	1.4	100	2.1	331	1.62	179	1.3	88
30	1.68	182	1.5	126	2.1	334	1.60	172	1.3	88
31	1.32	82	.....	.....	2.0	300	.....	.....	1.25	78

NOTE.—Discharge determined from three rating curves, all fairly well defined below gage height 2.0 feet, and applicable as follows: Mar. 16 to 29, Mar. 30 to May 24, and June 4 to July 31. For the period May 25 to June 3, the indirect method for shifting channels was used. Discharge Mar. 1 to 15 estimated at 30 second-feet, and Mar. 19 to 27 at 45 second-feet.

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Monthly discharge of Prickly Pear Creek at East Helena, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	.....	a 25	1,540	D.
February	.....	.....	a 30	1,670	D.
March	199	.....	48.7	2,990	D.
April	162	50	107	6,370	B.
May	366	89	192	11,800	B.
June	450	156	215	12,800	B.
July	240	78	114	7,010	B.
The period	.....	.....	.....	44,200	

a Estimated.

LUMP GULCH CREEK NEAR CLANCY, MONT.

Location.—In sec. 4, T. 8 N., R. 3 W., at the ranch of Charles Zastrow, 1 mile from Clancy, 15 miles from Helena, and half a mile above the junction of the creek with Prickly Pear Creek.

Records available.—July 15, 1908, to July 31, 1913, when station was discontinued.

Drainage area.—Not measured.

Gage.—Staff, on left bank directly south of observer's house. A new gage was set October 12, 1910, at the original site but at a datum 1 foot lower than that previously used. All gage heights for 1910 were reduced to new datum.

Control.—Sandy and shifting, likely to be blocked by drift.

Discharge measurements.—Made by wading.

Winter flow.—Affected by ice.

Diversions.—The water of Lump Gulch Creek has been extensively used for placer mining. At present the creek furnishes some water for irrigation, but the valley is narrow and affords but little irrigable land. The normal flow of the stream is appropriated.

Accuracy.—Data not entirely satisfactory; no flood records have been obtained.

Discharge measurements of Lump Gulch Creek near Clancy, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Mar. 31	R. R. Randell	1.32	12.5
May 13	C. S. Heidel	1.69	49

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Daily gage height, in feet, and discharge, in second-feet, of Lump Gulch Creek near Clancy, Mont., for 1913.

[Chas. Zastrow, observer.]

Day.	March.		April.		May.		June.		July.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			1.2	7	1.4	18	1.65	44	1.3	12
2			1.1	3.7	1.4	18	1.65	44	1.3	12
3			1.2	7	1.4	18	1.6	37	1.45	22
4			1.25	9	1.4	18	1.6	37	1.35	14
5			1.2	7	1.45	22	1.55	32	1.3	12
6			1.3	12	1.45	22	1.4	18	1.3	12
7			1.4	18	1.45	22	1.35	14	1.25	9
8			1.3	12	1.5	26	1.35	14	1.25	9
9			1.25	9	1.5	26	1.4	18	1.2	7
10			1.2	7	1.5	26	1.9	79	1.2	7
11			1.25	9	1.6	37	1.5	26	1.15	5
12			1.2	7	1.65	44	1.4	18	1.1	3.7
13			1.3	12	1.7	50	1.35	14	1.05	2.6
14			1.45	22	1.65	44	1.3	12	1.05	2.6
15			1.35	14	1.6	37	1.3	12	1.0	1.5
16			1.35	14	1.5	26	1.3	12	1.0	1.5
17			1.4	18	1.5	26	1.3	12	1.05	2.6
18			1.45	22	1.5	26	1.35	14	1.05	2.6
19			1.3	12	1.5	26	1.35	14	.9	.5
20			1.3	12	1.55	32	1.35	14	.9	.5
21			1.4	18	1.55	32	1.35	14	.85	.2
22			1.5	26	1 6	37	1.35	14	.85	.2
23			1.4	18	1.6	37	1.35	14	.85	.2
24			1.35	14	1.6	37	1.35	14	.9	.5
25			1.4	18	1.65	44	1.4	18	.9	.5
26			1.4	18	1.7	50	1.4	18	.9	.5
27			1.55	32	1.9	79	1.45	22	.9	.5
28			1.5	26	1.9	79	1.45	22	.9	.5
29			1.45	22	1.8	64	1.45	22	.9	.5
30			1.45	22	1.75	57	1.45	22	.85	.2
31	1.32	13			1.7	50			.85	.2

NOTE.—Discharge determined from a rating curve fairly well defined below 50 second-feet.

Monthly discharge of Lump Gulch Creek near Clancy, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	32	3.7	14.9	887	B.
May	79	18	36.5	2,240	B.
June	79	12	22.2	1,320	B.
July	22	.2	4.62	284	B.
The period				4,730	

TENMILE CREEK NEAR HELENA, MONT.

Location.—In the SW. ¼ SE. ¼ sec. 22, T. 10 N., R. 4 W., opposite the Broadwater Hotel, near Helena, Mont.

Records available.—July 8, 1908, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff, on right bank; datum unchanged.

Channel.—Shifts somewhat during flood stages.

Discharge measurements.—Made by wading.

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Winter flow.—Affected by ice.

Diversions.—Part of the water supply for the city of Helena is taken from Tenmile Creek above the station. Two irrigation ditches also take water from the creek above the gage. The entire low-water flow is appropriated and used before it reaches the mouth of the creek.

Accuracy.—At low and medium stages conditions favor accurate determination of discharge.

Discharge measurements of Tenmile Creek near Helena, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 17	B. E. Jones	a 1.93	8.4	May 26	B. E. Jones	4.00	266
Feb. 20	R. R. Randell	a 1.83	6.8	June 4	R. R. Randell	3.30	146
Apr. 2	do	1.78	8.1	July 17	J. M. Ray	2.05	19.0
May 10	C. S. Heidel	3.37	157	Oct. 29	do	2.18	17.7
14	do	3.48	156	Nov. 29	W. A. Lamb	1.9	5.9

a Ice present.

Daily gage height, in feet, of Tenmile Creek near Helena, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.92	3.00	3.8	2.78	1.7	1.6	1.7	2.2	2.0
2	.....	1.79	2.97	3.55	2.78	1.6	1.55	1.75	2.15	1.95
3	.....	1.77	2.88	3.4	3.10	1.6	1.55	1.75	2.1	1.85
4	.....	1.82	2.88	3.25	2.96	1.6	1.5	1.8	2.1	1.85
5	.....	1.87	2.78	3.2	2.88	1.55	1.55	1.85	2.15	1.85
6	.....	1.87	2.83	3.10	2.78	1.6	1.55	1.85	2.15	1.85
7	.....	1.97	2.98	2.98	2.68	1.6	1.55	2.0	2.1	1.85
8	.....	1.92	3.10	2.98	2.63	1.65	1.55	2.05	2.1	1.85
9	.....	1.87	3.25	2.98	2.58	2.0	1.5	2.05	2.1	1.85
10	.....	1.92	3.4	2.78	2.53	1.95	1.55	2.0	2.15	1.85
11	.....	2.02	3.65	2.88	2.43	2.0	1.55	1.95	2.25	1.9
12	.....	2.27	3.75	4.20	2.43	1.9	1.55	2.1	2.2	1.9
13	.....	2.32	3.7	3.55	2.43	1.9	1.55	2.3	2.15	1.9
14	.....	2.47	3.7	3.4	2.38	1.8	1.5	2.2	2.15	1.9
15	.....	2.67	3.4	3.15	2.28	1.65	1.55	2.2	2.15	1.9
16	.....	2.57	3.5	3.2	2.23	1.7	1.55	2.1	2.15	1.85
17	.....	2.67	3.5	3.2	2.08	1.6	1.55	2.0	2.15	1.8
18	.....	2.77	3.55	3.15	2.03	1.6	1.55	2.0	2.15	1.85
19	.....	2.97	3.45	3.15	1.98	1.6	1.5	2.05	2.1	1.85
20	.....	2.97	3.5	3.0	1.98	1.55	1.55	2.1	2.1	1.85
21	.....	3.20	3.45	2.90	1.93	1.55	1.55	2.15	2.0	1.85
22	.....	3.25	3.5	2.83	1.88	1.55	1.6	2.15	1.95	1.9
23	.....	3.15	3.55	2.78	1.83	1.55	1.6	2.2	1.95	1.9
24	.....	2.93	3.75	2.73	1.88	1.55	1.65	2.2	2.0	1.9
25	.....	2.92	3.9	2.73	1.93	1.5	1.7	2.55	2.0	1.9
26	.....	2.97	4.1	2.83	2.08	1.55	1.7	2.4	2.0	1.9
27	.....	3.20	4.1	3.10	1.98	1.55	1.7	2.3	2.0	1.9
28	.....	3.15	4.3	2.76	1.88	1.6	1.7	2.25	1.95	1.9
29	.....	3.1	4.2	2.78	1.78	1.65	1.65	2.2	1.95	1.9
30	1.97	3.0	4.0	2.78	1.78	1.6	1.7	2.2	1.95	1.85
31	1.97	.....	3.8	.....	1.73	1.6	.....	2.2	.....	1.85

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Daily discharge, in second-feet, of Tenmile Creek near Helena, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	13	97	228	72	6.0	2.5	2.2	18	9.0
2	8.3	93	183	72	3.8	1.8	2.9	16	7.4
3	7.8	83	156	110	3.8	1.8	2.9	14	4.8
4	9.3	83	132	92	3.8	1.2	3.6	14	4.8
5	11	72	125	83	3.0	1.7	4.8	16	4.8
6	11	77	110	72	3.8	1.6	4.8	16	4.8
7	15	95	95	62	3.8	1.5	9.0	14	4.8
8	13	110	95	58	4.9	1.5	11	14	4.8
9	11	132	95	53	16	1.0	11	14	4.8
10	13	156	72	49	14	1.4	9.0	16	4.8
11	18	201	83	42	16	1.3	7.4	21	5.9
12	32	219	308	42	12	1.3	14	18	5.9
13	35	210	183	42	12	1.2	24	16	5.9
14	45	210	156	39	8.6	.9	18	16	5.9
15	61	156	118	33	4.9	1.1	18	16	5.9
16	53	174	125	30	6.0	1.1	14	16	4.8
17	61	174	125	21	3.8	1.1	9.0	16	3.6
18	71	183	118	18	3.8	1.0	9.0	16	4.8
19	93	165	118	16	3.8	.7	11	14	4.8
20	93	174	97	16	3.0	1.0	14	14	4.8
21	125	165	85	14	2.8	.9	16	9.0	4.8
22	132	174	77	13	2.7	1.2	16	7.4	5.9
23	118	183	72	9.7	2.7	1.2	18	7.4	5.9
24	89	219	67	12	2.5	1.7	18	9.0	5.9
25	87	248	67	14	1.8	2.2	38	9.0	5.9
26	93	288	77	21	2.4	2.2	30	9.0	5.9
27	125	288	110	16	2.2	2.2	24	9.0	5.9
28	118	328	70	13	2.8	2.2	21	7.4	5.9
29	110	308	72	8.1	3.6	1.7	18	7.4	5.9
30	97	288	72	8.1	2.7	2.2	18	7.4	4.8
31	.....	228	.....	6.8	2.5	.....	18	.....	4.8

NOTE.—Discharge determinued from two fairly well defined rating curves applicable to Aug. 20 and after Sept. 21, respectively. Indirect method for shifting channels used Aug. 21 to Sept. 20.

Monthly discharge of Tenmile Creek near Helena, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	.....	a 8.0	492	D.
February	.....	.....	a 6.0	333	D.
March	.....	.....	a 8.0	492	D.
April	132	7.8	58.9	3,500	B.
May	328	72	179	11,000	B.
June	308	67	116	6,900	B.
July	110	6.8	37.3	2,290	B.
August	16	1.8	5.34	328	C.
September	2.5	.7	1.48	88.1	C.
October	38	2.2	14.0	861	C.
November	21	7.4	13.2	786	B.
December	9.0	3.6	5.44	334	B.
The year	328	.....	38.0	27,400	

a Estimated.

NOTE.—Accuracy for October is reduced because applicability of curve is uncertain.

SEVENMILE CREEK AT BIRDSEYE, MONT.

Location.—In SW. ¼ sec. 31, T. 11 N., R. 4 W., at Richard Tobin's ranch, one-fourth mile from Birdseye, Mont.

Records available.—March 27, 1909, to July 31, 1913. From July 16, 1908, to August 26, 1908, a station was maintained on this stream at Dr. Head's ranch, near Helena.

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Drainage area.—Not measured.
Gage.—Staff.
Control.—Sandy and shifting.
Discharge measurements.—Made by wading.
Winter flow.—Affected by ice.
Diversions.—Entire flow of creek is appropriated and used for irrigation. Some placer mining on the creek above station. Water is stored during certain parts of the day and released at others, causing rapid fluctuations in stage.

Discharge measurements of Sevenmile Creek at Birdseye, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 19	W. A. Lamb	2.38	19.7
May 24	B. E. Jones	2.83	34
June 4	R. R. Randell	2.51	23.1

Daily gage height, in feet, and discharge, in second-feet, of Sevenmile Creek at Birdseye, Mont., for 1913.

[R. Tobin, observer.]

Day.	March.		April.		May.		June.		July.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			2.38	19	2.28	16	2.78	32	2.78	32
2			2.18	13	2.28	16	2.73	31	2.78	32
3			2.03	9	2.28	16	2.58	25	2.73	31
4			2.03	9	2.38	19	2.58	25	2.68	29
5			2.08	10	2.38	19	2.66	28	2.63	27
6			2.08	10	2.48	22	2.58	25	2.58	25
7			2.03	9	2.38	19	2.48	22	2.48	22
8			2.08	10	2.38	19	2.48	22	2.48	22
9			2.13	12	2.33	18	2.58	25	2.48	22
10			2.18	13	2.43	21	2.58	25	2.48	22
11			2.18	13	2.38	19	2.63	29	2.48	22
12			2.08	10	2.43	21	2.78	32	2.48	22
13			2.08	10	2.48	22	2.88	36	2.48	22
14	2.78		2.08	10	2.38	19	2.78	32	2.48	22
15	2.78		2.18	13	2.48	22	2.78	32	2.48	22
16	2.78		2.03	9	2.48	22	2.74	31	2.38	19
17	2.78		2.08	10	2.43	21	3.98	39	2.38	19
18	2.78		2.23	15	2.48	22	2.88	36	2.28	16
19	2.78		2.38	19	2.48	22	2.88	36	2.28	16
20			2.28	16	2.58	25	2.78	32	2.28	16
21			2.38	19	2.53	24	2.88	36	2.18	13
22			2.28	16	2.48	22	3.08	43	2.18	13
23			2.38	19	2.48	22	3.08	43	2.18	13
24			2.33	18	2.68	29	2.98	39	2.18	13
25			2.38	19	2.83	34	2.98	39	2.18	13
26			2.38	19	2.88	36	2.98	39	2.18	13
27			2.28	16	2.78	32	2.98	39	2.18	13
28			2.38	19	3.03	41	2.98	39	2.18	13
29	4.98		2.33	18	2.98	39	2.78	32	2.18	13
30	2.58		2.23	15	2.98	39	2.78	32	2.18	13
31	2.33				2.88	36			2.18	13

NOTE.—Gage heights for March affected by ice.
Discharge determined from a fairly well defined rating curve. Discharge estimated June 17 because of probable error in gage height.

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Monthly discharge of Sevenmile Creek at Birdseye, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	19	9	13.9	827	B.
May	41	16	24.3	1,490	B.
June	43	22	32.5	1,930	B.
July	32	13	19.5	1,200	B.

LITTLE PRICKLY PEAR CREEK BASIN.

LITTLE PRICKLY PEAR CREEK NEAR MARYSVILLE, MONT.

Location.—At highway bridge on ranch of Casper Traufer, about 5 miles west and 3 miles north of Marysville, Mont.; about one-fourth mile below the mouth of Deadman Creek.

Records available.—April 12, 1913, to December 31, 1913, at present site; May 18, 1909, to December, 1911, at station formerly maintained above mouth of Deadman Creek.

Drainage area.—Not measured.

Gage.—Staff. From April 12 to May 23 gage was located about one-fourth mile farther upstream at a different datum, but where flow is practically the same as at site now used. Datum unchanged since May 24, 1913.

Control.—May shift during high water.

Discharge measurements.—Made from bridge during high water and by wading at ordinary stages.

Winter flow.—Affected by ice.

Diversions.—Many small ditches take water from the stream, practically the entire flow being appropriated.

Discharge measurements of Little Prickly Pear Creek near Marysville, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 12	C. S. Heidel	2.40	23	June 20	R. R. Randell	2.14	148
May 24	do	3.98	[a] 186	July 17	C. S. Heidel	1.50	50
24	do	2.6	[b] 208	Aug. 10	do	1.27	28
27	do	3.06	292	Oct. 3	do	1.10	14.7

[a] This is the water flowing in regular channel, and should be used in determining daily flow up to May 21.
[b] This is the total discharge referred to gage datum at new section, which is used for all subsequent readings.

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Daily gage height, in feet, of Little Prickly Pear Creek near Marysville, Mont., for 1913.

[Casper Traufer, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3.15	2.8	1.9	1.35	1.15	1.1	1.1	1.1
2	.....	3.00	2.7	1.8	1.35	1.15	1.1	1.1	1.05
3	.....	2.92	2.6	1.8	1.3	1.15	1.1	1.1	1.05
4	.....	2.95	2.5	1.8	1.3	1.15	1.15	1.1	1.05
5	.....	2.85	2.4	1.75	1.3	1.15	1.15	1.1	1.05
6	.....	2.82	2.3	1.7	1.35	1.15	1.15	1.1	1.05
7	.....	2.88	2.3	1.7	1.35	1 15	1.15	1.1	1.05
8	.....	3.00	2.3	1.7	1.3	1.15	1.15	1.1	1.05
9	.....	3.1	2.3	1.65	1.3	1.15	1.15	1.1	1.05
10	.....	3.2	2.3	1.6	1.3	1.1	1.15	1 1	1 05
11	.....	3.4	2.3	1.6	1.3	1.1	1.15	1.1	1.05
12	2.52	3.6	2.5	1.6	1.3	1.1	1.15	1.1	1.05
13	2.65	3.6	2.6	1.6	1.3	1.1	1.15	1.1	1.05
14	2.75	3.6	2.6	1.55	1.3	1.1	1.15	1.1	1 05
15	2.80	3.5	2.5	1.5	1.3	1.1	1.15	1.1	1.0
16	2.75	3.5	2.4	1.5	1.3	1.1	1.15	1.1	1.0
17	2.82	3.45	2.35	1.5	1.3	1.1	1.15	1.1	1.0
18	2.95	3.5	2.3	1.48	1.25	1.1	1.15	1.1	1.0
19	2.10	3.5	2.2	1.50	1.25	1.1	1.15	1.1	1.0
20	3.20	3.45	2.2	1.42	1.25	1.1	1.15	1.1	1.0
21	3.25	3.5	2.15	1.40	1.25	1.1	1.15	1.1	1.0
22	3.30	3.6	2.1	1.4	1.25	1.1	1.15	1.1	1.0
23	3.20	3.8	2.05	1.4	1.2	1.1	1.15	1.1	1.0
24	3.10	2.6	2.0	1.4	1.2	1.1	1.15	1.1	1.0
25	3.00	.....	2.0	1.4	1.2	1.15	1.15	1.1	1.0
26	3.00	3.0	1.95	1.4	1.2	1.15	1.15	1.1	1.0
27	3.15	3.1	2.0	1.4	1.2	1.1	1.15	1.1	1.0
28	3.20	3.2	1.95	1.4	1.2	1.1	1.15	1.1	1.0
29	3.20	3.1	1.9	1.35	1.15	1.1	1.1	1.1	1.0
30	3.15	2.9	1.9	1.35	1.15	1.1	1.1	1.1	1.0
31	.....	2.8	.....	1.35	1.15	.....	1.1	.....	1.0

NOTE.—Gage heights Apr. 12 to May 23 and May 24 to Dec. 31 read at stations about one-fourth mile apart, but with practically the same flow. Gage height Apr. 19 probably erroneous.

Daily discharge, in second-feet, of Little Prickly Pear Creek near Marysville, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	92	246	102	36	18	15	15	15
2	.....	77	229	87	36	18	15	15	12
3	.....	69	212	87	31	18	15	15	12
4	.....	72	196	87	31	18	18	15	12
5	.....	62	180	80	31	18	18	15	12
6	.....	59	164	74	36	18	18	15	12
7	.....	65	164	74	36	18	18	15	12
8	.....	77	164	74	31	18	18	15	12
9	.....	87	164	68	31	18	18	15	12
10	.....	97	164	62	31	15	18	15	12
11	.....	119	164	62	31	15	18	15	12
12	34	141	196	62	31	15	18	15	12
13	44	141	212	62	31	15	18	15	12
14	52	141	212	56	31	15	18	15	12
15	57	130	196	50	31	15	18	15	8
16	52	130	180	50	31	15	18	15	8
17	59	124	172	50	31	15	18	15	8
18	72	130	164	48	26	15	18	15	8
19	87	130	148	50	26	15	18	15	8
20	97	124	148	42	26	15	18	15	8
21	102	130	140	40	26	15	18	15	8
22	108	141	132	40	26	15	18	15	8
23	97	164	124	40	22	15	18	15	8
24	87	212	117	40	22	15	18	15	8
25	77	245	117	40	22	18	18	15	8
26	77	280	110	40	22	18	18	15	8
27	92	297	117	40	22	15	18	15	8
28	97	315	110	40	22	15	18	15	8
29	97	297	102	36	18	15	15	15	8
30	92	263	102	36	18	15	15	15	8
31	.....	246	.....	36	18	.....	15	.....	8

NOTE.—Discharge determined as follows: Apr. 12 to May 23, from a fairly well defined rating curve; May 24 to Dec. 31, from a well-defined rating curve change due to change in position of gage and not to a shift in the channel. Discharge estimated Apr. 19 and interpolated May 25.

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Monthly discharge of Little Prickly Pear Creek near Marysville, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 12-30	108	34	77.9	2,940	B.
May	315	59	150	9,220	B.
June	246	102	162	9,640	A.
July	102	36	56.6	3,480	A.
August	36	18	27.8	1,710	A.
September	18	15	16.1	958	A.
October	18	15	17.4	1,070	A.
November	15	15	15.0	893	A.
December	15	8	9.9	609	A.
The period				30,500	

LITTLE PRICKLY PEAR CREEK NEAR CANYON CREEK, MONT.

Location.—In sec. 9, T. 12 N., R. 5 W., near Canyon Creek post office, Mont. Principal tributaries above the station are Canyon, Marsh, Lost Horse, and Deadman creeks.

Records available.—April 1, 1909, to December 31, 1911; April 12 to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff.

Channel.—Permanent at ordinary stages; will shift at flood stages.

Discharge measurements.—Made by wading.

Winter flow.—Affected by ice.

Diversions.—Many small ditches take water from this stream and the low-water flow is practically all appropriated.

Discharge measurement of Little Prickly Pear Creek near Canyon Creek, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 12	C. S. Heidel	3.00	110	July 17	C. S. Heidel	2.50	55
May 24	do	4.3	424	Aug. 19	do	2.20	30
27	do	4.6	553	Oct. 3	do	2.15	26
June 20	R. R. Randell	3.92	276				

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Daily gage height, in feet, of Little Prickly Pear Creek near Canyon Creek, Mont., for 1913.

[W. J. Carbis, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3.6	4.4	3.6	2.2	2.1	2.1	2.2	2.0
2	.....	3.5	4.3	3.5	2.15	2.0	2.15	2.2	2.0
3	.....	3.4	4.2	3.4	2.1	2.0	2.15	2.25	2.0
4	.....	3.3	4.1	3.3	2.1	2.0	2.2	2.3	2.1
5	.....	3.2	4.0	3.4	2.05	2.0	2.2	2.3	2.1
6	.....	3.25	3.85	3.4	2.1	2.0	2.25	2.3	2.15
7	.....	3.3	3.6	3.5	2.1	2.1	2.3	2.4	2.1
8	.....	3.4	3.6	3.4	2.05	2.1	2.3	2.4	2.2
9	.....	3.5	3.5	3.4	2.1	2.15	2.3	2.5	2.2
10	.....	3.6	3.6	3.3	2.1	2.1	2.35	2.5	2.2
11	.....	3.7	3.7	3.2	2.1	2.15	2.3	2.4	2.2
12	3.0	3.95	4.4	3.2	2.1	2.2	2.3	2.4	2.3
13	3.25	4.0	4.2	3.1	2.1	2.2	2.2	2.3	2.3
14	3.4	3.9	4.1	3.0	2.0	2.1	2.2	2.2	2.3
15	3.35	.....	4.0	3.0	2.05	2.1	2.1	2.2	2.2
16	3.4	.....	3.9	2.9	1.95	2.0	2.0	2.25	2.2
17	3.5	.....	4.0	2.8	2.1	2.0	2.0	2.2	2.3
18	3.5	3.3	3.95	2.8	2.2	2.0	2.1	2.2	2.3
19	3.75	3.4	4.2	2.9	2.2	2.0	2.1	2.1	2.3
20	3.85	3.6	4.0	2.8	2.2	2.1	2.0	2.1	2.4
21	3.9	3.8	3.9	2.7	2.2	2.1	2.05	2.2	2.3
22	3.9	3.9	3.8	2.6	2.1	2.1	2.0	2.3	2.3
23	3.75	4.1	3.7	2.5	2.1	2.2	2.0	2.3	2.25
24	3.65	4.3	3.6	2.4	2.1	2.2	2.1	2.25	2.25
25	3.45	4.4	3.7	2.3	2.1	2.2	2.1	2.2	2.1
26	3.4	4.5	3.8	2.3	2.05	2.1	2.15	2.1	2.1
27	3.7	4.6	3.8	2.4	2.05	2.1	2.1	2.1	2.0
28	3.6	4.7	3.7	2.5	2.1	2.2	2.2	2.2	2.0
29	3.55	4.8	3.6	2.4	2.1	2.25	2.2	2.1	2.1
30	3.55	4.6	3.6	2.3	2.15	2.2	2.1	2.0	2.1
31	.....	4.5	.....	2.2	2.1	.....	2.1	.....	2.1

Daily discharge, in second-feet, of Little Prickly Pear Creek near Canyon Creek, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	215	460	215	30	23	23	30	17
2	.....	195	415	195	26	17	26	30	17
3	.....	175	375	175	23	17	26	34	17
4	.....	158	340	158	23	17	30	37	23
5	.....	141	310	175	20	17	30	37	23
6	.....	150	272	175	23	17	34	37	26
7	.....	158	215	195	23	23	37	45	23
8	.....	175	215	175	20	23	37	45	30
9	.....	195	195	175	23	26	37	53	30
10	.....	215	215	158	23	23	41	53	30
11	.....	235	235	141	23	26	37	45	30
12	111	298	460	141	23	30	37	45	37
13	150	310	375	125	23	30	30	37	37
14	175	285	340	111	17	23	30	30	37
15	166	250	310	111	20	23	23	30	30
16	175	220	285	98	15	17	17	34	30
17	195	190	310	86	23	17	17	30	37
18	195	158	298	86	30	17	22	30	37
19	148	175	375	98	30	17	23	23	37
20	272	215	310	86	30	23	17	23	45
21	285	260	285	74	30	23	20	30	37
22	285	285	260	63	23	23	17	37	37
23	248	340	235	53	23	30	17	37	34
24	225	415	215	45	23	30	23	34	34
25	185	460	235	37	23	30	23	30	23
26	175	510	260	37	20	23	26	23	23
27	235	560	260	45	20	23	23	23	17
28	215	610	235	53	23	30	30	30	17
29	205	665	215	45	23	34	30	23	23
30	205	560	215	37	26	30	23	17	23
31	.....	510	.....	30	23	.....	23	.....	23

NOTE.—Discharge determined from a well-defined rating curve. Discharge interpolated May 15 to 17.

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Monthly discharge of Little Prickly Pear Creek near Canyon Creek, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 12-30	285	111	203	7,650	A.
May	665	141	300	18,400	B.
June	460	195	291	17,300	A.
July	215	30	110	6,760	B.
August	30	15	23.4	1,440	A.
September	34	17	23.4	1,390	A.
October	41	17	26.8	1,650	A.
November	53	17	33.7	2,010	A.
December	45	17	28.5	1,750	A.
The period				58,400	

NOTE.—Accuracy for July reduced because hydrographer and observer do not check on gage reading.

SUN RIVER BASIN.

ADJUDICATED WATER RIGHTS.

Practically the entire unappropriated flow of Sun River and its tributaries has been filed on by the United States Reclamation Service for the irrigation of 276,000 acres of land on the Sun River project. Most of this water will be obtained from the storage of flood waters.

The following table shows the adjudicated water rights on the river and its tributaries.

Summary of appropriations by creeks.

	Second-feet.
Sun River [1]	582.530
Dry Creek	30.450
Rock Camp Creek	3.375
Simms Creek	23.600
North Fork of Sun River [2]	203.395
Richardson Creek	1.250
Francis Creek	1.875
Buttolph Creek	1.000
South Fork of Sun River	120.860
Du Bra Creek	49.200
Elk Creek	18.740
Hay Coulee	1.000
Frank Goss Creek	8.340
West Creek	0.625
Smith Creek	64.250
Ford Creek	46.400
Smith Lake	6.250
Duval Creek	1.875

[1] Rights belonging to United States Reclamation Service or subsequent to United States Reclamation Service appropriations on Sun River, 30.41 second-feet.

[2] Rights subsequent to United States Reclamation Service appropriations on North Fork of Sun River 12.00 second-feet.

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	Second-feet.
Willow Creek [1]	38.300
Breed Creek	1.000
Little Willow Creek	21.520
Spring Coulee	2.000
Cutrock Creek	0.660
Barr Creek	6.500
Furman Creek	3.000
Springs, lakes, and coulees tributary to Little Willow Creek	7.580
	1,245.575
Rights belonging to United States Reclamation Service or subsequent to United States Reclamation Service appropriations	44.510
Rights prior to United States Reclamation Service appropriations	1,201.065

NORTH FORK OF SUN RIVER NEAR AUGUSTA, MONT.

Location.—In sec. 33, T. 22 N., R. 7 W., near the Hennessy Co.'s ranch, 12 miles northwest of Augusta, 21 miles southwest of Chouteau, Mont.

Records available.—October 31, 1903, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Chain.

Control.—Permanent.

Discharge measurements.—Made from cable.

Winter flow.—Affected by ice.

Diversions.—Water diverted below station for irrigation of valley lands; no diversions above station.

Accuracy.—Conditions for accurate determination of discharge excellent except during the winter months.

Discharge measurements of North Fork of Sun River near Augusta, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 28	B. E. Jones	2.41	1,530
June 1	....do	5.81	7,900
26	....do	3.37	2,750
Aug. 29	....do	1.06	466

[1] Rights belonging to United States Reclamation Service on Willow Creek, 2.10 second-feet.

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Daily gage height, in feet, of North Fork of Sun River near Augusta, Mont., for 1913.

[Mrs. Nora Duncan, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	0.6	0.6	0.4	0.5	2.25	6.1	3.3	1.6	0.95	0.85	1.0	0.9
2	.65	.55	.35	.5	2.2	6.3	3.2	1.6	.95	.85	1.0	.8
3	.65	.....	.3	.6	2.15	6.2	3.1	1.55	.95	.85	1.0	.7
4	.6	.....	.3	.6	2.05	5.9	3.0	1.55	.9	.9	.9	.65
5	.7	.....	.4	.65	2.0	5.7	2.8	1.5	.9	.8	1.0	.7
6	.6	.....	.25	.55	2.1	5.4	2.8	1.5	.9	.8	1.0	.7
7	.6	.....	.25	.55	2.15	5.3	2.7	1.45	.8	.8	.95	.7
8	.6	.....	.2	.6	2.2	5.3	2.6	1.45	.85	.8	.95	.7
9	.6	.55	.2	.6	2.3	5.3	2.6	1.45	.85	.8	.9	.7
10	.7	.65	.3	.75	2.6	5.3	2.45	1.4	.8	.8	.9	.65
11	.6	.6	.2	.65	2.6	5.3	2.6	1.45	.8	.8	.95	.6
12	.6	.6	.25	.7	2.7	5.2	2.4	1.45	.85	.9	1.0	.55
13	.6	.6	.25	.9	2.8	5.0	2.3	1.4	.9	1.0	.95	.55
14	.6	.6	.25	1.2	3.1	4.9	2.3	1.35	.9	1.1	.9	.55
15	.7	.7	.35	1.4	3.2	4.7	2.2	1.4	.9	1.05	.9	.6
16	.6	.6	.3	1.6	2.7	4.5	2.25	1.35	.9	1.0	.95	.6
17	.55	.6	.3	1.8	2.6	4.3	2.2	.35	.8	.95	.95	.6
18	.55	.55	.3	1.9	2.6	4.2	2.05	1.35	.8	1.0	.95	.6
19	.5	.55	.3	2.15	2.5	4.1	1.95	1.35	.85	.9	.9	.55
20	.6	.6	.4	2.3	2.6	3.8	1.95	1.35	.85	.9	.9	.5
21	.5	.5	.3	2.5	2.7	3.9	1.95	1.35	.85	.9	.85	.5
22	.5	.5	.35	2.6	3.0	3.7	1.9	1.3	.85	.9	.8	.5
23	.5	.5	.35	2.3	3.6	3.7	1.85	1.3	.85	.9	.85	.5
24	.6	.5	.35	2.1	3.9	3.6	1.8	1.25	.8	.95	.8	.6
25	.8	.6	.4	2.0	4.6	3.5	1.75	1.25	.8	.95	.8	.7
26	.7	.45	.4	2.0	5.2	3.4	1.8	1.25	.85	1.0	.85	.7
27	.7	.4	.4	2.1	6.2	3.6	1.75	1.2	.8	1.0	.8	.7
28	.65	.4	.4	2.4	6.3	3.5	1.75	1.15	.8	1.05	.8	.75
29	.6	.....	.45	2.15	6.6	3.5	1.7	1.1	.8	1.05	.8	.8
30	.7	.....	.55	2.35	6.2	3.4	1.7	1.05	.85	1.0	.85	.85
31	.6	.....	.5	.....	6.2	.....	1.65	1.0	.....	.95	.....	.8

NOTE.—Gage heights, Feb. 3 to 8 and Dec. 24 to 31, distorted by ice.

Daily discharge, in second-feet, of North Fork of Sun River near Augusta, Mont., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	210	210	130	170	1,400	8,580	2,700	830	380	325	410	280
2	230	190	115	170	1,350	9,080	2,550	830	380	325	410	280
3	230	.....	100	210	1,300	8,830	2,410	790	380	325	410	280
4	210	.....	100	210	1,200	8,080	2,270	790	350	350	350	230
5	250	.....	130	230	1,160	7,590	2,010	750	350	300	410	250
6	210	.....	90	190	1,250	6,870	2,0.0	750	350	300	410	250
7	210	.....	90	190	1,300	6,630	1,890	715	300	300	380	250
8	210	.....	80	210	1,350	6,630	1,770	715	325	300	380	250
9	210	190	80	210	1,450	6,630	1,770	715	325	300	350	250
10	250	230	100	275	1,770	6,630	1,600	680	300	300	350	230
11	210	210	80	230	1,770	6,630	1,770	715	300	300	380	210
12	210	210	90	250	1,890	6,390	1,550	715	325	350	410	190
13	210	210	90	350	2,010	5,930	1,450	680	350	410	380	190
14	210	210	90	540	2,410	5,710	1,450	645	350	470	350	190
15	250	250	115	680	2,550	5,270	1,350	680	350	440	350	210
16	210	210	100	830	1,890	4,850	1,400	645	350	410	380	210
17	190	210	100	990	1,770	4,450	1,350	645	300	380	380	210
18	190	190	100	1,070	1,770	4,250	1,200	645	300	410	380	210
19	170	190	100	1,300	1,660	4,0'0	1,120	645	325	350	350	190
20	210	210	130	1,450	1,770	3,510	1,120	645	325	350	350	170
21	170	170	100	1,660	1,890	3,690	1,120	645	325	350	326	170
22	170	170	115	1,770	2,270	3,340	1,070	610	325	350	300	170
23	170	170	115	1,450	3,170	3,340	1,090	610	325	350	325	170
24	210	170	115	1,250	3,690	3,170	990	575	300	380	300	.....
25	300	210	130	1,160	5,060	3,010	950	575	300	380	300	.....
26	250	150	130	1,160	6,390	2,850	990	575	325	410	325	.....
27	250	130	130	1,250	8,830	3,170	950	540	300	410	300	.....
28	230	130	130	1,550	9,080	3,010	950	505	300	440	300	.....
29	210	.....	150	1,300	9,830	3,010	910	470	300	440	300	.....
30	250	.....	190	1,500	8,830	2,850	910	440	325	410	325	.....
31	210	.....	170	.....	8,830	.....	870	410	.....	380	.....	.....

NOTE.—Discharge determined from a well-defined rating curve. Discharge Feb. 3 to 8 and Dec. 24 to 31 estimated, because of ice, at 160 second-feet.

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Monthly discharge of North Fork of Sun River near Augusta, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	300	170	216	13,300	C.
February	250	.....	185	10,300	C.
March	190	80	112	6,890	C.
April	1,770	170	794	47,200	B.
May	9,830	1,160	3,250	200,000	B.
June	9,080	2,850	5,270	314,000	B.
July	2,700	870	1,470	90,400	A.
August	830	410	651	40,000	A.
September	380	300	328	19,500	A.
October	470	300	364	22,400	A.
November	410	300	356	21,200	A.
December	350	.....	206	12,700	B.
The year	9,830	80	1,100	798,000	

NOTE.—Accuracy for January, February, and March reduced because of possible effect of ice; accuracy for April, May, and June reduced on account of there being but one reading per day. When the snow is going off in the mountains this does not represent the mean flow. The results are probably low.

SUN RIVER AT FORT SHAW, MONT.

Location.—In the SW. ¼ sec. 1, T. 20 N., R. 2 W., at Fort Shaw, Mont.

Records available.—May 16, 1912, to December 31, 1913. A station on Sun River at Sun River, maintained previous to 1912, gave practically the same data.

Drainage area.—Not measured.

Gage.—Staff gage put in September 1, 1913, on the right bank about 1,000 feet above footbridge; gage heights beginning September 1, 1913, referred to that gage. Previous to that date a standard chain gage fastened to the footbridge near the right bank was used.

Control.—Probably permanent.

Discharge measurements.—At high and medium stages made from footbridge below gage; at low stages made by wading.

Winter flow.—Affected by ice.

Diversions.—Adjudicated rights for diverting 248 second-feet from Sun River direct and 664 second-feet from tributaries above this station. In addition to this the Fort Shaw canal of the United States Reclamation Service takes out about 200 second-feet during the irrigation season.

Storage.—Willow Creek reservoir has a capacity of 84,320 acre-feet.

Accuracy.—Conditions for obtaining accurate discharge data good; results for 1912 and 1913 only fair, owing to errors in the gage.

Discharge measurements of Sun River at Fort Shaw, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 25	B. E. Jones	61.83	1,380	July 10	Towle and White	61.99	1,780
May 30	F. Towle	65.56	11,300	17	.....do	61.52	989
June 4	B. E. Jones	65.13	8,790	Sept. 1	B. E. Jones	a 61.31	377
30	.....do	63.01	3,300				

a Affected by backwater from diversion dam 200 feet below. New gage installed this date reads 2.05 feet.

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Daily gage height, in feet, and discharge, in second-feet, of Sun River at Fort Shaw, Mont., for 1913.

[United States Reclamation Service engineers, observers.]

Day.	April.		May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	62.15	1,790	65.0	8,500	62.9	3,020	61.95	692	2.05	377
2	.....	.....	61.9	1,460	65.3	9,400	62.8	2,840	61.95	692	.....	377
3	.....	.....	61.9	1,460	65.4	9,700	62.7	2,660	61.85	610	.....	377
4	60.9	496	61.8	1,340	65.1	8,800	62.6	2,480	61.85	610	.....	377
5	.....	.....	61.75	1,280	64.8	7,900	62.5	2,310	61.75	532	2.05	377
6	.....	.....	61.7	1,230	64.6	7,300	62.5	2,310	61.75	570	2.0	351
7	.....	.....	61.6	1,120	64.5	7,000	62.5	2,310	61.75	570	2.0	351
8	.....	.....	61.8	1,340	64.5	7,000	62.4	2,150	61.7	532	2.0	351
9	.....	.....	62.0	1,590	64.7	7,600	62.3	2,000	61.7	532	1.95	325
10	.....	.....	61.95	1,520	64.7	7,600	62.1	1,720	61.65	495	1.95	325
11	.....	.....	62.45	2,230	64.6	7,300	62.0	1,590	61.65	532	1.95	325
12	.....	.....	62.7	2,660	64.6	7,300	61.95	1,520	61.65	532	1.95	325
13	.....	.....	62.8	2,840	64.5	7,000	61.9	1,460	61.65	532	1.95	325
14	.....	.....	62.7	2,660	64.6	7,300	61.75	1,280	61.55	458	1.95	325
15	.....	.....	62.4	2,150	63.6	4,520	61.7	1,230	61.55	458	1.95	325
16	.....	.....	62.5	2,310	63.2	3,620	61.6	1,120	61.55	495	1.95	325
17	.....	.....	62.35	2,080	63.5	4,290	61.55	1,070	61.5	458	1.95	325
18	.....	.....	62.3	2,000	63.2	3,620	61.4	920	61.45	420	1.95	325
19	.....	.....	62.45	2,230	63.3	3,840	61.35	872	61.45	420	1.95	325
20	.....	.....	62.35	2,080	63.4	4,060	61.4	920	61.4	385	1.95	325
21	62.3	2,000	62.35	2,080	63.2	3,620	61.3	825	61.45	458	1.95	325
22	.....	1,950	62.45	2,230	63.2	3,620	61.3	825	61.4	420	1.95	325
23	.....	1,900	62.6	2,480	62.9	3,020	61.25	780	61.4	420	2.0	351
24	62.2	1,860	63.2	3,620	62.9	3,020	61.3	825	61.4	420	2.0	351
25	61.9	1,460	63.8	5,000	62.7	2,660	61.45	805	.....	420	2.0	351
26	61.9	1,460	63.9	5,250	62.9	3,020	61.8	790	61.35	420	2.0	351
27	.....	1,730	65.0	8,500	63.0	3,210	62.9	770	61.3	385	1.95	325
28	62.3	2,000	65.3	9,400	63.2	3,620	62.9	755	.....	385	1.95	325
29	62.0	1,590	65.6	10,300	63.0	3,210	62.8	740	61.3	385	1.95	325
30	62.0	1,590	65.3	9,400	62.9	3,020	62.8	725	61.3	385	1.95	325
31	.....	.....	65.1	8,800	.....	.....	62.6	710	61.3	385	.....	.....

NOTE.—Discharge determined from a well-defined curve. Results for May and June probably somewhat low, as gage was read only once a day. Discharge July 25–31 interpolated on account of dam being built. Apr. 1–3 and 5–20 discharge estimated from North Fork of Sun, South Fork of Sun, and Willow Creek.

Monthly discharge of Sun River at Fort Shaw, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	.....	.....	1,020	60,700	C.
May	10,300	1,120	3,370	207,000	C.
June	9,700	2,660	5,520	328,000	C
July	3,020	710	1,430	87,900	C.
August	692	385	484	29,800	C.
September	377	325	340	20,200	B.
The period	.....	.....	.....	734,000	

WILLOW CREEK NEAR AUGUSTA, MONT.

Location.—In NW. ¼ SW. ¼ sec. 26, T. 21 N., R. 7 W., at the Clark Co. ranch, just below the mouth of Little Willow Creek and about 7 miles northwest of Augusta.

Records available.—June 8, 1905, to May 14, 1911; April 1, 1912, to December 31, 1913.

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Drainage area.—Not measured.

Gage.—Standard chain on right bank near observer's house.

Control.—Permanent.

Winter flow.—No ice forms at this station, as a large spring enters the creek just above the gage.

Diversions.—Adjudicated water rights above station amount to 36.2 second-feet from Willow Creek proper and 42.26 second-feet from tributaries. The United States Reclamation Service has an old right of 2.1 second-feet and has also filed on the total flow of the creek, subject to the above prior appropriations. No water is diverted from Willow Creek proper below the station, the amount used by the United States Reclamation Service being diverted from Sun River below the mouth of Willow Creek.

Storage.—Willow Creek dam, about 2 miles below the station, provides a reservoir with a capacity of 84,320 acre-feet, for use on the Fort Shaw unit of the Sun River project.

Accuracy.—Conditions for obtaining accurate discharge data are excellent.

Discharge measurements of Willow Creek near Augusta, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 28	B. E. Jones	2.09	62
June 2	do	4.00	163
27	do	3.48	143
Aug. 30	do	0.88	9.7

Daily gage height, in feet, of Willow Creek near Augusta, Mont., for 1913.

[Elizabeth Ireland, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.25	1.8	3.9	2.35	1.19	0.82	0.76	1.04	0.94
2	.....	1.2	1.8	3.8	2.25	1.14	.79	.76	1.04	.89
3	.....	1.3	1.8	3.9	2.12	1.14	.79	.76	1.04	.89
4	.....	1.4	1.8	3.6	2.15	1.16	.76	.76	1.14	.89
5	.....	1.55	1.8	3.5	2.05	1.19	.76	.76	1.04	.89
6	.....	2.05	1.8	3.4	2.05	1.19	.76	.76	1.02	.89
7	.....	1.6	1.9	3.25	1.95	1.14	.76	.76	.94	.....
8	.....	1.65	1.85	3.2	1.85	1.24	.76	.79	1.04	.....
9	.....	1.4	1.8	3.1	1.86	1.34	.76	.82	1.04	.....
10	.....	1.5	1.9	3.1	1.82	1.29	.76	.84	1.04	.....
11	.....	1.55	2.25	3.1	1.76	1.14	.76	1.14	1.02	.....
12	.....	1.6	2.1	3.0	1.75	1.14	.76	1.44	.99	.....
13	.....	1.75	2.15	2.9	1.72	1.12	.76	1.29	1.04	.....
14	.....	1.75	2.1	2.8	1.70	1.09	.76	1.19	1.04	.....
15	.....	1.75	2.1	2.6	1.66	1.04	.76	1.09	1.09	.....
16	0.95	1.75	2.05	2.45	1.65	1.04	.76	1.04	1.02	.....
17	.9	1.7	2.0	2.3	1.62	1.04	.76	.99	.99	.....
18	.9	1.75	3.0	2.25	1.54	1.04	.76	.99	.99	.....
19	.85	1.85	3.2	2.25	1.49	1.02	.76	.99	.94	.....
20	.9	2.15	2.9	2.35	1.46	.99	.76	.99	.99	.....
21	.9	2.2	2.8	2.15	1.44	.94	.76	.99	.94	.....
22	.8	2.15	3.0	2.1	1.44	.94	.76	.99	.94	.....
23	.85	1.85	3.3	2.05	1.44	.92	.76	1.04	1.04	.....
24	.8	1.8	3.3	1.9	1.42	.86	.82	1.04	1.04	.....
25	.85	1.8	3.5	2.25	1.39	.84	.82	1.04	1.04	.....
26	.8	1.8	3.9	2.35	1.59	.84	.82	1.04	1.04	.....
27	.8	1.75	4.0	3.35	1.39	.84	.79	.99	1.04	.....
28	.9	2.0	4.2	2.7	1.29	.84	.79	.94	.99	.....
29	.9	1.7	4.2	2.6	1.39	.84	.76	.94	.99	.....
30	1.2	1.95	4.1	2.5	1.24	.84	.76	.89	.94	.....
31	1.35	.....	4.0	.....	1.19	.84	.....	1.09	.....	.....

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Daily discharge, in second-feet, of Willow Creek near Augusta, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	23	48	166	76	21	8.0	6.5	15	11
2	.....	21	48	159	70	19	7.2	6.5	15	9.8
3	.....	25	48	166	64	19	7.2	6.5	15	9.8
4	.....	29	48	145	66	19	6.5	6.5	19	9.8
5	.....	36	48	138	60	21	6.5	6.5	15	9.8
6	.....	60	48	132	60	21	6.5	6.5	14	9.8
7	.....	38	53	123	56	19	6.5	6.5	11	.....
8	.....	40	50	120	50	23	6.5	7.2	15	.....
9	.....	29	48	114	51	27	6.5	8	15	.....
10	.....	33	53	114	49	25	6.5	8.5	15	.....
11	.....	36	70	114	46	19	6.5	19	14	.....
12	.....	38	63	108	46	19	6.5	31	13	.....
13	.....	46	66	103	44	18	6.5	25	15	.....
14	.....	46	63	98	43	17	6.5	21	15	.....
15	.....	46	63	88	41	15	6.5	17	17	.....
16	12	46	60	80	40	15	6.5	15	14	.....
17	10	43	58	73	39	15	6.5	13	13	.....
18	10	46	108	70	35	15	6.5	13	13	.....
19	8.8	50	120	70	33	14	6.5	13	11	.....
20	10	66	103	76	31	13	6.5	13	13	.....
21	10	68	98	66	31	11	6.5	13	11	.....
22	7.5	66	106	63	31	11	6.5	13	11	.....
23	8.8	50	126	60	31	11	6.5	15	15	.....
24	7.5	48	126	53	30	9	8.0	15	15	.....
25	8.8	48	138	70	29	8.5	8.0	15	15	.....
26	7.5	48	166	76	38	8.5	8.0	15	15	.....
27	7.5	46	173	129	29	8.5	7.2	13	15	.....
28	10	58	189	93	25	8.5	7.2	11	13	.....
29	10	43	189	88	29	8.5	6.5	11	13	.....
30	21	56	181	83	23	8.5	6.5	9.8	11	.....
31	27	.....	173	.....	21	8.5	.....	17	.....	.....

NOTE.—Discharge determined from a fairly well-defined rating curve.

Monthly discharge of Willow Creek near Augusta, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 16–31	27	7.5	11	349	B.
April	68	21	44.3	2,640	B.
May	189	48	94.6	5,820	B.
June	166	53	101	6,010	B.
July	76	21	42.5	2,610	B.
August	27	8.5	15.3	941	B.
September	8	6.5	6.79	404	B.
October	31	6.5	12.8	787	B.
November	19	11	14	833	B.
December 1–6	11	9.8	10	119	B.
The period	.....	.....	.....	20,510	

SOUTH FORK OF SUN RIVER AT AUGUSTA, MONT.

Location.—In sec. 17, T. 20 N., R. 6 W., at the highway bridge on the road from Augusta to Craig, Mont., about half a mile from Augusta.

Records available.—December 2, 1904, to December 31, 1913.

Drainage area.—Not measured.

Gage.—The original gage was spiked to the cribwork of the right abutment on the downstream side of the bridge; a new gage was installed April 17, 1907, at a different datum and was used during 1907 and 1908; records for 1909 to 1913 are referred to the old gage.

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Control.—Shifting.

Discharge measurements.—High-stage measurements may be made from the highway bridge; low-stage measurements are made by wading.

Winter flow.—Affected by ice.

Diversions.—Water is diverted to irrigate the valley lands both above and below the station. During dry seasons the entire summer flow is utilized.

Discharge measurements of South Fork of Sun River at Augusta, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 26	B. E. Jones	1.97	186	June 28	B. E. Jones	2.32	498
26	do	1.97	188	Aug. 30	do	1.02	32
June 2	do	2.48	586	Nov. 6	W. A. Lamb	1.26	63

Daily gage height, in feet, of South Fork of Sun River at Augusta, Mont., for 1913.

[W. J. Auchard, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.7	2.0	2.5	1.90	1.2	1.1	1.0	1.2	1.2
2	1.7	2.0	2.5	1.82	1.2	1.1	1.0	1.2	1.25
3	1.7	2.0	2.5	1.80	1.15	1.1	1.0	1.2	1.3
4	1.7	2.0	2.4	1.80	1.1	1.1	1.12	1.2	1.4
5	1.8	2.00	2.25	1.72	1.1	1.1	1.1	1.22	1.3
6	1.9	1.98	2.2	1.70	1.1	1.1	1.1	1.25	1.3
7	1.8	2.00	2.15	1.6	1.1	1.0	1.1	1.22	1.3
8	1.7	2.0	2.1	1.6	1.1	1.0	1.15	1.20	.....
9	1.7	2.0	1.95	1.6	1.1	1.0	1.15	1.2	.....
10	1.7	2.0	1.9	1.6	1.3	1.0	1.15	1.2	.....
11	1.7	2.05	1.9	1.5	1.2	1.0	1.20	1.2	.....
12	1.8	2.1	2.05	1.4	1.2	1.0	1.22	1.2	.....
13	1.8	2.1	2.0	1.5	1.2	1.0	1.25	1.2	.....
14	1.9	2.1	2.0	1.5	1.2	1.0	1.3	1.2	.....
15	2.0	2.1	1.95	1.5	1.2	1.0	1.3	1.2	.....
16	1.9	2.1	1.92	1.4	1.20	1.0	1.3	1.2	.....
17	1.9	2.1	1.85	1.4	1.18	1.0	1.3	1.2	.....
18	1.9	2.3	1.8	1.4	1.20	1.0	1.3	1.2	.....
19	2.0	2.4	1.7	1.40	1.2	1.0	1.22	1.2	.....
20	2.2	2.3	1.75	1.32	1.15	1.0	1.2	1.2	.....
21	2.0	2.3	1.7	1.28	1.1	1.0	1.2	1.25	.....
22	2.1	2.4	1.6	1.25	1.1	1.0	1.2	1.15	.....
23	2.0	2.5	1.6	1.22	1.1	1.0	1.2	1.2	.....
24	2.0	2.6	1.6	1.15	1.1	1.0	1.2	1.2	.....
25	2.0	2.7	1.7	1.1	1.1	1.0	1.2	1.2	.....
26	2.0	2.75	1.90	1.3	1.1	1.0	1.3	1.2	.....
27	2.05	2.9	2.42	1.3	1.1	1.0	1.3	1.2	.....
28	2.05	3.0	2.32	1.2	1.1	1.0	1.3	1.2	.....
29	2.05	2.8	2.20	1.2	1.1	1.0	1.3	1.2	.....
30	2.05	2.7	2.2	1.2	1.1	1.0	1.25	1.2	.....
31	.....	2.65	.....	1.2	1.1	.....	1.2	.....	.....

NOTE.—Gage heights for December possibly affected by ice.

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Daily discharge, in second-feet, of South Fork of Sun River at Augusta, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	100	200	605	260	53	40	30	53	53
2	100	200	605	228	53	40	30	53	62
3	100	200	605	220	46	40	30	53	70
4	100	200	535	220	40	40	43	53	62
5	130	200	440	192	40	40	40	56	70
6	160	192	410	185	40	40	40	62	70
7	130	200	382	150	40	30	40	56	78
8	100	200	355	150	40	30	46	53	.....
9	100	200	282	150	40	30	46	53	.....
10	100	200	260	150	70	30	46	53	.....
11	100	220	260	119	53	30	53	53	.....
12	130	240	330	92	53	30	56	53	.....
13	130	240	305	119	53	30	62	53	.....
14	160	240	305	119	53	30	70	53	.....
15	200	240	282	119	53	30	70	53	.....
16	160	240	269	92	53	30	70	53	.....
17	160	240	240	92	50	30	70	53	.....
18	160	330	220	92	53	30	70	53	.....
19	200	394	185	92	53	30	56	53	.....
20	290	350	202	74	46	30	53	53	.....
21	200	350	185	67	40	30	53	62	.....
22	240	428	150	62	40	30	53	46	.....
23	200	502	150	56	40	30	53	53	.....
24	200	584	150	46	40	30	53	53	.....
25	200	669	185	40	40	30	53	53	.....
26	200	730	260	70	40	30	70	53	.....
27	220	895	549	70	40	30	70	53	.....
28	220	1,020	483	53	40	30	70	53	.....
29	220	835	410	53	40	30	70	53	.....
30	220	757	410	53	40	30	62	53	.....
31	.....	730	.....	53	40	.....	53	.....	.....

NOTE.—Discharge determined as follows: Apr. 1 to May 17 from a fairly well-defined rating curve; May 18 to 31 by indirect method for shifting channels; June 1 to Dec. 7, from a well-defined rating curve.

Monthly discharge of South Fork of Sun River at Augusta, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	290	100	164	9,760	B.
May	1,020	192	394	24,200	C.
June	650	150	334	19,900	B.
July	260	40	114	7,010	B.
August	70	40	45.9	2,820	B.
September	40	30	32.0	1,900	B.
October	70	30	54.2	3,330	B.
November	62	46	53.6	3,190	B.
December, 1-7	92	53	69.6	966	C.
The period	.....	.....	.....	73,100	

NOTE.—Accuracy, June to December, reduced because observer did not read the gage very closely.

MARIAS RIVER BASIN.

MARIAS RIVER NEAR SHELBY, MONT.

Location.—In sec. 20, T. 31 N., R. 2 W., at the highway bridge near James A. Johnson's ranch, 7 miles south of Shelby, Mont.

Records available.—April 4, 1902, to June 30, 1906; March 21, 1911, to December 31, 1913.

Drainage area.—2,610 square miles.

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Gages.—Bristol automatic and a staff gage set when the station was reestablished in 1911, at practically the same datum as the standard chain gage which was read during 1905–6 and which was fastened to the upstream guard rail of the bridge.

Control.—Likely to shift after freshets.

Discharge measurements.—Made from highway bridge, lower chord of which is about 15 feet above low water.

Winter flow.—Affected by ice.

Cooperation.—Several discharge measurements furnished by the engineers of the Valier-Montana Land & Water Co.

Discharge measurements of Marias River near Shelby, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 10	R. O. Crawford	3.83	1,110	June 19	W. A. Lamb	4.93	2,220
May 13	L. B. Crossan	5.00	2,680	30	R. O. Crawford	5.03	2,380
June 7	C. S. Heidel	6.40	4,640	July 28	C. S. Heidel	3.58	781
13	J. B. Stewart	5.95	3,570	Oct. 28	W. A. Lamb	[a] 3.60	699

[a] Gage height affected by wind action.

Daily gage height, in feet, of Marias River near Shelby, Mont., for 1913.

[A. Bryant, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	3.9	4.15	.....	4.2	4.35	7.3	5.0	3.35	3.2	2.85	3.5	3.35
2	3.9	4.2	.....	.....	4.35	7.2	4.7	3.35	3.15	2.85	3.5	3.3
3	3.95	4.15	.....	4.5	4.3	7.2	4.5	3.3	3.15	2.9	3.45	3.3
4	3.9	4.0	.....	4.6	.....	7.1	4.5	3.3	3.1	2.9	3.45	3.3
5	3.9	4.0	4.4	3.9	4.2	6.8	4.4	3.3	3.05	2.9	3.45	3.3
6	3.95	.....	4.4	4.0	4.15	6.6	4.25	3.3	3.05	2.95	3.4	3.3
7	3.95	4.15	.....	.....	4.1	6.4	4.15	3.25	3.0	3.0	3.4	3.2
8	3.9	4.2	4.3	3.95	4.3	6.3	4.0	3.3	3.0	3.0	3.4	3.2
9	.....	4.15	4.35	3.8	4.3	6.2	4.0	3.35	2.95	3.0	3.4	3.3
10	4.0	4.3	4.35	3.95	4.45	6.2	4.0	3.7	2.9	3.0	3.4	3.3
11	4.0	4.4	.....	4.3	4.45	6.3	4.0	3.75	2.9	3.0	3.4	3.2
12	4.0	4.5	4.2	4.35	4.8	6.1	3.95	3.75	2.9	3.0	3.4	3.2
13	4.15	4.5	.....	4.35	5.1	5.9	3.9	3.7	2.9	3.2	3.4	3.2
14	4.0	.....	4.0	.....	5.2	5.8	3.85	3.65	2.9	3.4	3.4	.....
15	4.15	4.45	4.0	4.8	5.2	5.6	3.75	3.9	2.9	3.6	3.4	.....
16	4.2	4.45	.....	4.6	5.2	5.4	3.7	3.85	2.85	3.65	3.4	.....
17	4.2	4.45	4.0	4.7	5.2	5.2	3.65	3.7	2.85	3.6	3.4	.....
18	4.15	.....	4.0	5.0	5.0	5.0	3.6	3.85	2.85	3.5	3.35	.....
19	4.15	.....	4.0	5.0	5.0	5.0	3.55	3.8	2.85	3.5	3.35	.....
20	4.2	.....	.....	.....	5.2	5.2	3.5	3.7	2.85	3.45	3.3	.....
21	4.2	.....	3.1	5.4	5.1	5.0	3.45	3.6	2.8	3.4	3.3	.....
22	4.2	.....	.....	5.4	5.2	5.0	3.45	3.5	2.8	3.4	3.3	.....
23	4.25	.....	3.85	5.4	5.5	4.8	3.45	3.45	2.85	3.4	3.35	.....
24	4.3	.....	.....	4.8	5.8	4.7	3.5	3.45	2.85	3.4	3.4	.....
25	4.3	.....	3.8	4.8	6.5	4.6	3.45	3.35	2.9	3.4	3.4	.....
26	4.25	.....	3.8	4.6	6.4	4.6	4.3	3.3	2.9	3.5	3.4	.....
27	4.0	.....	3.8	4.6	6.8	5.1	3.6	3.25	2.9	3.6	3.4	.....
28	4.0	.....	3.85	4.45	7.5	5.3	3.55	3.25	2.85	3.6	3.4	.....
29	4.15	.....	3.9	4.45	7.6	5.1	3.5	3.2	2.85	3.55	3.4	.....
30	4.0	.....	.....	4.4	7.6	5.0	3.45	3.2	2.85	3.5	3.35	.....
31	4.15	.....	.....	.....	7.5	.....	3.4	3.2	.....	3.5	.....	.....

NOTE.—Gage heights affected by ice Jan. 1 to Apr. 5.

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Daily discharge, in second-feet, of Marias River near Shelby, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,160	1,870	6,030	2,300	585	480	265	620	585
2	1,160	1,870	5,880	1,920	585	445	265	620	470
3	1,480	1,810	5,880	1,680	550	445	290	580	470
4	1,590	1,750	5,730	1,680	550	410	290	580	470
5	1,160	1,700	5,280	1,570	550	380	290	580	470
6	1,260	1,640	4,980	1,400	550	380	320	540	470
7	1,240	1,590	4,680	1,300	515	350	350	540	410
8	1,210	1,810	4,460	1,150	550	350	350	540	410
9	1,060	1,810	4,230	1,150	585	320	350	540	470
10	1,210	1,990	4,160	1,150	870	290	350	540	470
11	1,590	1,990	4,230	1,150	915	290	350	540	410
12	1,640	2,420	3,860	1,100	915	290	350	540	410
13	1,640	2,810	3,520	1,050	870	290	480	540	410
14	1,930	2,940	3,380	1,000	825	290	620	540	.....
15	2,220	2,940	3,100	915	1,050	290	780	540	.....
16	1,990	2,940	2,820	870	1,000	265	835	540	.....
17	2,140	2,940	2,560	825	870	265	770	540	.....
18	2,550	2,680	2,300	780	1,000	265	680	505	.....
19	2,580	2,680	2,300	740	960	265	680	505	.....
20	2,870	2,940	2,560	700	870	265	630	470	.....
21	3,160	2,810	2,300	660	780	240	590	470	.....
22	3,190	2,940	2,300	660	700	240	580	470	.....
23	3,210	3,360	2,040	660	660	265	570	505	.....
24	3,790	3,780	1,920	700	660	265	560	540	.....
25	3,800	4,830	1,800	660	585	290	550	540	.....
26	2,170	4,680	1,800	1,460	550	290	630	540	.....
27	2,170	5,280	2,430	780	515	290	710	540	.....
28	1,990	6,330	2,690	740	515	265	700	540	.....
29	1,990	6,480	2,430	700	480	265	660	540	.....
30	1,930	6,480	2,300	660	480	265	620	505	.....
31	.....	6,330	.....	620	480	.....	620	.....	.....

NOTE.—Discharge determined as follows: to Apr. 13, from a rating curve fairly well defined above, and well defined below, 1,800 second-feet; Apr. 14 to 25, by indirect method for shifting channels; Apr. 26 to June 7, from a fairly well-defined rating curve; June 8 to 12 by indirect method for shifting channels; June 13 to Dec. 13, from a fairly well-defined rating curve, Apr. 1 to 4, estimated. Discharge interpolated for days for which gage heights are missing.

Monthly discharge of Marias River near Shelby, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	3,800	1,060	2,040	121,000	C.
May	6,480	1,590	3,170	195,000	B.
June	6,030	1,800	3,460	206,000	B.
July	2,300	620	1,060	65,200	B.
August	1,050	480	696	42,800	B.
September	480	240	310	18,400	B.
October	825	265	519	31,900	B.
November	620	470	538	32,000	B.
December 1-13	505	410	450	11,600	B.
The period	.....	.....	.....	724,000	

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TWO MEDICINE RIVER AT FAMILY, MONT.

Location.—In the NE. ¼ sec. 2, T. 31 N., R. 9 W., at the Holy Family Mission, 16 miles southeast of Browning, Mont., and about 6 miles above the mouth of Badger Creek, the nearest tributary.

Records available.—April, 1907, to December 31, 1913.

Drainage area.—368 square miles.

Gage.—Overhanging chain gage installed September 18, 1913, on left bank of stream directly back of the mission buildings. The datum of original gage, which was at same site as present gage, was lowered 0.95 foot July 21, 1908. The original chain gage and bench marks were destroyed by flood of June 2, 1913, and on June 10 a staff gage was installed at a different datum on the left bank about 125 feet above site of chain gage. On July 23 this staff gage was removed to location of the chain gage and was set to read 1.85 feet higher than staff gage installed June 10. The present chain gage, installed September 18, was set to read 1.00 foot higher than the staff gage installed July 23 at same site.

Control.—Gravel.

Discharge measurements.—Low-water measurements made by wading at section near the gage; high-water measurements must be made from the old wagon bridge about 3 miles above the mission.

Winter flow.—Affected by ice.

Diversions and storage.—Water is diverted at a point about 2 miles above the gage by a ditch which supplies water for about 100 acres of land on the farm at the Holy Family Mission. The United States Reclamation Service has under construction a project which will use about 200 second-feet of water for irrigating land north of the stream for the Blackfeet Indians. The water will be diverted near the mouth of Little Badger Creek, a small tributary entering from the south above the station. A storage reservoir will be built at Two Medicine Lake near the headwaters of the stream to augment the low-water flow.

Accuracy.—Results good except for winter months.

Discharge measurements of Two Medicine River at Family, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 10	B. E. Jones	[a] 1.88	177	Sept. 18	W. A. Lamb	[d] 1.75	67
June 10[b]	J. B. Stewart	[c] 2.90	1,850	Oct. 22	.....do	[d] 2.50	178
18[b]	W. A. Lamb	[c] 1.61	1,210	Dec. 22	.....do	[d] 1.53	38
July 23	.....do	[d e] 2.79	274				

[a] Gage height on old chain gage.
[b] Measured from bridge 3 miles above gage.
[c] Height on gage established June 10.
[d] Height on gage established Sept. 18.
[e] Height referred to gage established June 10 is −0.06 feet.

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Daily gage height, in feet, of Two Medicine River at Family, Mont., for 1913.

[Hugh Neubert, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.3	9.0	1.35	2.65	2.25	1.65	1.95	2.05
2	.....	2.6	9.6	1.35	2.6	2.15	1.65	1.95	2.05
3	.....	2.6	.....	1.15	2.6	2.15	1.65	2.0	2.05
4	.....	2.8	.....	1.15	2.6	2.15	1.65	1.95	2.05
5	.....	2.9	.....	.95	2.8	2.25	1.65	1.85	2.05
6	.....	2.9	.....	.75	2.8	2.25	1.75	1.8	2.05
7	.....	2.95	.....	.75	2.8	2.2	2.2	1.75	2.05
8	.....	2.85	.....	.75	2.9	2.2	2.35	1.75	2.05
9	.....	2.75	.....	.75	3.0	2.2	2.35	1.75	2.05
10	1.88	2.8	2.95	.75	3.0	1.95	2.55	1.75	2.05
11	2.25	2.8	2.95	.6	2.95	1.95	3.0	1.75	2.05
12	2.40	3.9	2.75	.6	3.0	2.25	3.05	1.65	2.05
13	2.34	3.8	2.55	.5	3.0	2.15	3.15	1.65	2.05
14	2.23	3.8	2.35	.5	.....	2.25	3.15	1.65	2.05
15	2.34	3.8	1.95	.4	.....	2.55	3.1	1.65	1.95
16	3.00	3.9	1.85	.2	.....	2.75	3.05	1.65	1.95
17	3.65	3.7	1.75	.2	3.6	.....	3.05	2.45	1.85
18	3.8	3.6	1.75	.1	3.4	1.75	3.0	2.45	1.85
19	3.9	3.7	1.55	.05	3.0	1.8	2.95	2.45	1.85
20	4.0	3.8	1.55	−.05	3.0	1.8	2.95	2.35	1.85
21	4.0	3.8	1.55	−.05	2.6	1.7	2.95	2.35	.....
22	3.6	4.4	1.55	−.05	2.4	2.05	2.95	2.35	1.53
23	3.3	4.8	1.55	2.8	2.4	2.3	2.95	2.25	.....
24	3.4	4.9	1.35	2.8	2.35	1.9	3.0	2.2	.....
25	3.7	5.2	1.35	2.8	2.35	1.85	3.05	2.15	.....
26	4.0	5.5	1.45	2.8	2.3	1.9	3.05	2.15	.....
27	4.0	6.5	1.55	2.8	2.35	1.85	3.05	2.15	.....
28	3.8	7.4	1.55	2.8	2.35	1.85	2.75	2.15	.....
29	3.8	8.2	1.75	2.8	2.35	1.8	2.75	2.15	.....
30	3.8	8.4	1.85	2.75	2.35	1.75	2.25	2.15	.....
31	.....	9.0	.....	2.7	2.35	.....	2.15	.....	.....

NOTE.—Gage record obtained as follows: To June 2, original chain gage; June 10 to July 22, from staff gage installed June 10; after July 22, referred to chain gage installed Sept. 18. Gage heights July 23 to Sept. 16, were observed on staff gage at same location as chain gage installed Sept. 18, and have been referred to that gage.

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Daily discharge, in second-feet, of Two Medicine River at Family, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	350	6,220	985	225	132	55	88	102
2	.....	480	6,800	985	210	118	55	88	102
3	.....	480	7,180	873	210	118	55	95	102
4	.....	595	6,220	873	210	118	55	88	102
5	.....	655	5,280	764	270	132	55	75	102
6	.....	655	3,380	660	270	132	65	70	102
7	.....	688	1,830	660	270	125	125	65	102
8	.....	625	1,830	660	305	125	150	65	102
9	.....	565	1,960	660	340	125	150	65	102
10	161	595	1,960	660	340	88	198	65	102
11	302	595	1,960	584	322	88	340	65	102
12	375	1,400	1,830	584	340	132	360	55	102
13	345	1,320	1,700	535	340	118	402	55	102
14	294	1,320	1,580	535	410	132	402	55	102
15	345	1,320	1,330	487	480	198	380	55	88
16	720	1,400	1,270	392	550	255	360	55	88
17	1,190	1,230	1,210	392	625	160	360	172	88
18	1,320	1,150	1,210	346	520	65	340	172	88
19	1,400	1,230	1,100	323	340	70	322	172	88
20	1,490	1,320	1,100	278	340	70	322	150	88
21	1,490	1,320	1,100	278	210	60	322	150	66
22	1,150	1,860	1,100	278	160	102	322	150	43
23	925	2,240	1,100	270	160	140	322	132	.....
24	1,000	2,330	985	270	150	80	340	125	.....
25	1,230	2,620	985	270	150	75	360	118	.....
26	1,490	2,900	1,040	270	140	80	360	118	.....
27	1,490	3,940	1,100	270	150	75	360	118	.....
28	1,320	4,700	1,100	270	150	75	255	118	.....
29	1,320	5,460	1,210	270	150	70	255	118	.....
30	1,320	5,660	1,270	255	150	65	132	118	.....
31	.....	6,220	.....	240	150	.....	118	.....	.....

NOTE.—Discharge determined as follows: Apr. 10 to June 2, from the curve for 1912, which is well defined up to 1,600 second-feet; June 10 to July 22 and July 23 to Dec. 22, from two curves fairly well defined throughout; June 3–9 estimated from information furnished by the observer.

Monthly discharge of Two Medicine River at Family, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 10–31	1,490	161	985	41,000	B.
May	6,220	350	1,850	114,000	B.
June	7,180	985	2,260	134,000	D.
July	985	240	490	30,100	B.
August	625	140	279	17,200	A.
September	255	60	111	6,600	B.
October	402	55	248	15,200	A.
November	172	55	101	6,010	B.
December	102	43	939	4,100	B.
The period	.....	.....	.....	368,000	

BADGER CREEK NEAR FAMILY, MONT.

Location.—In the NE. ¼ sec. 19, T. 31 N., R. 8 W., near the road crossing 4 miles east of Family, Mont.

Records available.—April 20, 1907, to December 31, 1913.

Drainage area.—224 square miles.

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Gage.—Chain. The original staff gage, established April 20, 1907, and bench marks were washed out in June, 1908, and a new gage was established July 22, 1908, about 400 feet farther upstream and at a different datum; as the bench mark was also destroyed the relation between the two gages could not be determined. The gage was again washed out on May 25, 1909, and was reset at a different datum and 400 feet below the old Piegan Mission crossing.

Control.—Two channels at both medium and low stages; at high stages the stream flows in several channels.

Discharge measurements.—High-water measurements made from a cable 4 miles above the gage; low-water measurements can be made by wading at the ford above the gage.

Diversions.—The United States Reclamation Service proposes to divert the natural flow of Badger Creek to irrigate land in the eastern part of the Blackfeet Indian Reservation north of Birch Creek.

Accuracy.—High-water measurements are only fair; low-water records good.

Discharge measurements of Badger Creek near Family, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 10	B. E. Jones	[a] 3.93	141	July 23	W. A. Lamb	4.05	207
June 11	J. B. Stewart	5.34	1,090	Oct. 22	do	3.88	162
18	W. A. Lamb	4.99	690	Dec. 22	do	[a] 3.28	33

[a] Ice present.

Daily gage height, in feet, of Badger Creek near Family, Mont., for 1913.

[Oliver J. Racine, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	4.5	5.65	4.6	3.85	3.8	3.7	3.85
2	.....	4.5	5.6	4.55	3.8	3.8	3.7	3.85
3	.....	4.45	5.65	4.55	3.8	3.8	3.65	3.9
4	.....	4.4	5.6	.....	3.85	3.8	.....	3.85
5	.....	4.4	5.6	4.55	3.8	3.8	3.7	3.85
6	.....	4.4	5.6	4.4	3.8	3.8	3.75	3.8
7	.....	4.3	5.6	4.45	3.85	3.8	3.7	3.8
8	.....	4.35	5.55	4.4	3.9	3.75	3.8	3.8
9	.....	4.3	5.45	4.35	3.8	3.75	3.8	3.8
10	.....	4.3	5.35	4.35	3.9	3.7	3.7	3.8
11	.....	5.05	5.3	4.3	3.9	3.7	3.7	3.8
12	.....	4.9	5.3	4.25	3.9	3.7	3.8	3.8
13	4.8	4.9	5.25	4.3	3.9	3.7	3.75	3.75
14	4.8	4.9	5.2	4.35	3.85	3.7	3.8	3.75
15	4.75	4.85	5.2	4.4	3.85	3.7	3.8	3.8
16	4.75	4.9	5.2	4.35	3.8	3.7	3.8	3.8
17	4.75	5.05	4.95	4.2	3.9	3.7	3.85	3.8
18	4.7	5.0	4.95	4.15	3.85	3.7	3.9	3.8
19	4.7	5.05	4.05	4.15	3.85	3.7	3.9	3.8
20	4.7	5.15	4.15	4.1	3.85	3.7	3.9	3.8
21	4.7	5.2	4.2	4.1	3.85	3.7	3.9	3.8
22	4.7	5.1	4.75	4.1	3.85	3.7	3.9	.....
23	4.65	5.35	4.8	4.1	3.9	3.7	3.9	.....
24	4.6	5.45	4.7	4.1	3.9	3.7	3.9	.....
25	4.6	5.55	4.75	4.1	3.9	3.7	3.95	.....
26	4.6	5.7	4.85	4.05	3.9	3.7	4.0	.....
27	4.6	5.85	4.75	4.05	3.9	3.7	4.05	.....
28	4.6	5.75	4.7	4.0	3.9	3.7	4.05	.....
29	4.55	5.75	4.6	3.95	3.85	3.7	4.0	.....
30	4.55	5.7	4.6	3.95	3.8	3.7	4.0	.....
31	.....	5.7	.....	3.9	3.85	.....	3.95	.....

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Daily discharge, in second-feet, of Badger Creek near Family, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	366	1,500	416	158	147	129	158
2	.....	366	1,430	391	147	147	129	158
3	.....	344	1,500	391	147	147	122	168
4	.....	322	1,430	391	158	147	126	158
5	.....	322	1,430	391	147	147	129	158
6	.....	322	1,430	322	147	147	138	147
7	.....	283	1,430	344	158	147	129	147
8	.....	302	1,360	322	168	138	147	147
9	.....	283	1,230	302	147	138	147	147
10	141	283	1,100	302	168	129	129	147
11	274	761	1,040	283	168	129	129	147
12	408	621	1,040	266	168	129	147	147
13	542	621	978	283	168	129	138	138
14	542	621	920	302	158	129	147	138
15	508	582	920	322	158	129	147	147
16	508	621	920	302	147	129	147	147
17	508	761	666	249	168	129	158	147
18	474	711	666	234	158	129	168	147
19	474	761	206	234	158	129	168	147
20	474	866	234	219	158	129	168	147
21	474	920	249	219	158	129	168	147
22	474	811	508	219	158	129	168	.....
23	445	1,100	542	219	168	129	168	.....
24	416	1,230	474	219	168	129	168	.....
25	416	1,360	508	219	168	129	180	.....
26	416	1,560	582	206	168	129	192	.....
27	416	1,780	508	206	168	129	206	.....
28	416	1,640	474	192	168	129	206	.....
29	391	1,640	416	180	158	129	192	.....
30	391	1,560	416	180	147	129	192	.....
31	.....	1,560	.....	168	158	.....	180	.....

NOTE.—Discharge determined from a fairly well-defined rating curve. Discharge Apr. 10 from current-meter measurement. Discharge interpolated for days for which gage heights are missing. Discharge Nov. 22–30 estimated at 135 second-feet.

Monthly discharge of Badger Creek near Family, Mont., for 1913.

[Drainage area, 224 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
April 10–30	542	141	434	1.94	1.51	18,100	B.
May	1,780	283	816	3.64	4.20	50,100	B.
June	1,500	206	870	3.88	4.33	51,800	B.
July	416	168	274	1.22	1.41	16,800	B.
August	168	147	159	.710	.82	9,780	B.
September	147	129	134	.598	.67	7,970	B.
October	206	122	157	.701	.81	9,650	B.
November	168	.....	145	.647	.72	8,630	C.
The period	.....	.....	.....	.....	.....	173,000	

CUT BANK CREEK AT CUT BANK, MONT.

Location.—In the SW. ¼ SW. ¼ sec. 1, T. 33 N., R. 6 W., half a mile west of Cut Bank, at the Great Northern Railway bridge, 12 miles above the mouth of Two Medicine River.

Records available.—August 4, 1905, to December 31, 1913.

Drainage area.—971 square miles.

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Gage.—A staff gage installed August 31, 1911, at a new section 200 yards above the original gage, which was an overhanging chain gage on left bank.

Control.—Gravel; shifts in flood.

Discharge measurements.—At high stages made from a cable 300 yards below gage; low-stage measurements made by wading.

Winter flow.—Affected by ice.

Diversions.—The intake of the Great Northern Railway's pumping station is situated 100 feet below the gage; the average quantity pumped is about 14,000 gallons an hour for 18 hours a day, equivalent to a continuous flow of 0.4 second-foot.

Accuracy.—Results as a whole are good.

Discharge measurements of Cut Bank Creek at Cut Bank, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 27	W. A. Lamb	4.81	300	Aug. 1	J. M. Ray	4.40	141
28	J. B. Stewart	4.90	386	Oct. 27	W. A. Lamb	4.28	98
June 12	do	5.50	824	Dec. 22[a]	do	4.40	18
19	W. A. Lamb	5.05	437				

[a] Ice at gage.

Daily gage height, in feet, of Cut Bank Creek at Cut Bank, Mont., for 1913.

[Gladys Ferris and Edward Freed, observers.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	4.70	5.7	5.10	4.40	4.20	4.00	4.30
2	.....	4.65	5.75	5.05	4.40	4.20	4.00	4.25
3	.....	4.65	5.7	5.00	4.40	4.20	4.00	4.25
4	.....	4.70	5.7	4.90	4.38	4.18	4.10	4.25
5	.....	4.68	5.60	4.90	4.38	4.18	4.10	4.20
6	.....	4.62	5.55	4.90	4.35	4.18	4.12	4.20
7	.....	4.65	5.48	4.90	4.30	4.15	4.12	4.20
8	.....	4.70	5.40	4.85	4.30	4.15	4.12	4.20
9	.....	4.70	5.40	4.70	4.35	4.12	4.10	4.20
10	.....	4.68	5.38	4.70	4.35	4.10	4.10	4.20
11	5.65	4.68	5.40	4.70	4.40	4.10	4.10	4.20
12	.....	4.68	5.38	4.70	4.40	4.10	4.15	4.15
13	.....	4.75	5.32	4.70	4.50	4.10	4.15	4.15
14	.....	4.88	5.28	4.68	4.50	4.10	4.20	4.15
15	.....	4.88	5.20	4.65	4.50	4.10	4.25	4.20
16	.....	4.90	5.15	4.65	4.50	4.10	4.25	4.20
17	3.85	4.90	5.12	4.60	4.45	4.10	4.30	4.20
18	3.80	4.90	5.05	4.58	4.45	4.10	4.30	4.20
19	3.75	4.95	5.00	4.55	4.40	4.08	4.30	4.20
20	3.75	4.92	5.10	4.55	4.35	4.08	4.30	4.20
21	3.80	4.90	5.18	4.55	4.30	4.05	4.30	4.20
22	3.85	4.92	5.10	4.58	4.30	4.05	4.30	4.18
23	3.70	4.98	5.02	4.58	4.30	4.05	4.30	4.15
24	3.65	5.20	5.00	4.55	4.25	4.00	4.30	4.15
25	3.65	5.32	5.00	5.80	4.25	4.00	4.30	4.15
26	3.60	5.50	5.08	4.55	4.28	4.00	4.30	4.20
27	4.8	5.65	5.20	4.55	4.20	4.00	4.30	4.20
28	4.9	5.8	5.28	4.55	4.20	4.00	4.30	.....
29	4.90	5.9	5.15	4.48	4.20	4.00	4.30	.....
30	4.88	5.85	5.35	4.48	4.20	4.00	4.30	.....
31	.....	5.8	.....	4.55	4.20	.....	4.30	.....

NOTE.—Gage heights Apr. 17–26 referred to the old chain gage. Gage height July 25 probably erroneous.

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Daily discharge, in second-feet, of Cut Bank Creek at Cut Bank, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	255	1,060	485	135	80	40	105
2	.....	232	1,120	450	135	80	40	92
3	.....	232	1,060	415	135	80	40	92
4	.....	255	1,060	355	129	76	60	92
5	.....	246	935	355	129	76	60	80
6	.....	219	880	355	120	76	64	80
7	.....	232	805	355	105	70	64	80
8	.....	255	725	330	105	70	64	80
9	.....	255	725	255	120	64	60	80
10	.....	246	708	255	120	60	60	80
11	995	246	725	255	135	60	60	80
12	930	246	708	255	135	60	70	70
13	860	280	657	255	170	60	70	70
14	790	345	624	246	170	60	80	70
15	725	345	560	232	170	60	92	80
16	660	355	522	232	170	60	92	80
17	596	355	500	210	152	60	105	80
18	543	355	450	202	152	60	105	80
19	494	385	415	190	135	56	105	80
20	494	367	485	190	120	56	105	80
21	543	355	545	190	105	50	105	80
22	596	367	485	202	105	50	105	76
23	445	403	429	202	105	50	105	70
24	406	560	415	190	92	40	105	70
25	406	657	415	305	92	40	105	70
26	367	825	471	190	100	40	105	80
27	305	995	560	190	80	40	105	80
28	355	1,180	624	190	80	40	105	80
29	355	1,330	522	163	80	40	105	70
30	345	1,260	682	163	80	40	105	70
31	.....	1,180	.....	190	80	.....	105	.....

NOTE.—Discharge determined as follows: Apr. 11, from gage height corrected for effect of ice; Apr. 11–16, interpolated; Apr. 17–26, from rating curve for the chain gage, applicable Mar. 8 to Nov. 19, 1910, and poorly defined for 1913; Apr. 27 to Nov. 27, from a fairly well-defined rating curve; Nov. 28–30, estimated. Gage height July 25 probably erroneous; discharge estimated.

Monthly discharge of Cut Bank Creek at Cut Bank, Mont., for 1913.

[Drainage area, 971 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
April 11–30	995	305	560	0.577	0.43	22,200	C.
May	1,330	219	478	.492	.57	29,400	B.
June	1,120	415	662	.682	.76	39,400	B.
July	485	163	260	.268	.31	16,000	B.
August	170	80	121	.125	.14	7,440	B.
September	80	40	58.5	.060	.07	3,480	B.
October	105	40	83.6	.086	.10	5,140	B.
November	105	70	79.2	.082	.09	4,710	B.
The period	.....	.....	.....	.....	.....	128,000	

BIRCH CREEK AT SWIFT DAM, NEAR DUPUYER, MONT.

Location.—At Swift dam, about 20 miles west of Dupuyer, Mont.

Records available.—March 26 to December 31, 1913.

Drainage area.—Not measured.

Gage.—Vertical staff on left bank, immediately below dam, was used during the high water, June 5 to July 16; before and after this period a vertical staff on the right bank about one-fourth mile below.

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Control.—Gravelly and shifting.

Discharge measurements.—Made from a foot log at high stages and by wading during normal periods.

Winter flow.—Probably affected by ice.

Diversions.—None above station.

Regulation.—Flow affected by operation of Swift dam during the high-water period of 1913.

Discharge measurements of Birch Creek at Swift dam, near Dupuyer, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec-ft.*			*Feet.*	*Sec-ft.*
Mar. 13	R. O. Crawford	0.34	49	July 10	L. B. Crossan	New 1.10	212
Apr. 5	C. S. Heidel	.33	49			1.00	
16	L. B. Crossan	.90	170	25	Heidel and Crossan	New .87	125
May 2	R. O. Crawford	.90	165			.80	
8	L. B. Crossan	.85	139	Aug. 28	L. B. Crossan	New .78	104
15	do	1.45	324			.66	
June 5	C. S. Heidel	New 2.25	815	Sept. 10	do	.58	83
		2.40		Oct. 18	W. S. Merrill	.70	99
13	R. O. Crawford	New 1.88	519	Dec. 4	do	.55	71
		1.90					
24	Crawford and Crossan	New 1.33	282				
		1.35					

NOTE.—The gage heights designated "New" refer to the newer or upper gage from which daily gage heights were taken June 5 to July 16.

Daily gage height, in feet, of Birch Creek at Swift dam, near Dupuyer, Mont., for 1913.

[W. J. Bridgeman et al., observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		0.32	1.0	2.75	1.35	0.70	0.64	0.50	0.73	0.54
2		.35	.95	2.7	1.3	.78	.62	.50	.76	.56
3		.35	.95	2.6	1.3	.75	.61	.50	.71	.56
4		.35	.95		1.2	.72	.60	.52	.71	.56
5		.38	.83	2.2	1.15	.77	.60	.53	.72	.52
6		.38	.81	2.1	1.2	.72	.59	.58	.70	.52
7		.34	.86	2.0	1.15	.67	.59	.57	.68	.52
8		.35	.83	2.1	1.1	.82	.60	.54	.68	.52
9		.41	.86	2.1	1.1	1.0	.58	.53	.68	.52
10		.45	1.3	2.1	1.1	1.1	.58	.54	.70	.50
11		.53	1.4	2.0	1.05	.94	.58	.64	.69	.50
12		.68	1.4	1.25	1.0	.89	.57	.97	.69	.50
13		.81	1.45	1.9	1.0	.86	.56	1.05	.68	.50
14		.91	1.45	1.85	1.0	.90	.56	.94	.67	.48
15		.91	1.5	1.7	.98	.86	.55	.81	.63	.48
16		.91	1.3	1.6	.96	.82	.54	.77	.64	.48
17		.91	1.35	1.6	.89	.80	.54	.72	.66	.48
18		1.0	1.4	1.6	.84	.86	.53	.70	.64	.47
19		1.2	1.3	1.6	.84	.81	.56	.68	.61	.46
20		1.35	1.4	1.6	.86	.79	.53	.68	.62	.40
21		1.35	1.55	1.5	.84	.78	.54	.71	.60	.38
22		1.3	1.75	1.4	.85	.74	.56	.72	.60	.40
23		1.15	2.0	1.4	.82	.72	.55	.78	.60	.40
24		1.05	2.25	1.35	.81	.70	.54	.98	.60	.39
25		1.05	2.35	1.35	.79	.70	.53	.92	.60	.48
26	0.25	1.15	2.5	1.3	.82	.69	.54	.86	.58	.48
27	.25	1.25	2.8	1.6	.76	.68	.54	.86	.56	.48
28	.30	1.2	2.85	1.5	.76	.67	.54	.78	.55	.48
29	.30	1.15	2.85	1.45	.78	.66	.52	.78	.57	.45
30	.30	1.05	2.85	1.4	.74	.66	.52	.76	.54	.46
31	.30		2.75		.72	.64		.74		.48

NOTE.—Gage heights June 5 to July 16 read on upper gage, about one-fourth mile above regular gage. This upper gage was established June 5, because of the unsatisfactory overflow conditions at the regular gage; but at low water the upper-gage section is very poor because it is wide and irregular, so the readings could not be taken there except at medium and high stages.

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Daily discharge, in second-feet, of Birch Creek at Swift dam, near Dupuyer, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		46	180	1,110	290	108	96	70	115	77
2		50	168	1,060	270	126	92	70	121	84
3		50	168	970	270	119	90	70	110	84
4		50	142	870	235	112	88	74	110	81
5		54	138	770	218	123	88	75	112	74
6		54	132	670	235	112	86	84	108	74
7		49	145	590	218	102	86	83	104	74
8		50	138	670	200	135	88	77	104	74
9		57	145	670	200	180	84	75	104	74
10		63	268	670	200	208	84	77	108	70
11		75	304	590	185	165	84	96	106	70
12		104	304	560	170	152	83	172	106	70
13		132	324	530	170	145	81	194	104	70
14		158	324	505	170	155	81	165	102	69
15		158	344	435	164	145	79	132	94	67
16		158	268	390	158	135	77	123	96	67
17		158	286	390	152	130	77	112	100	67
18		180	304	390	140	145	75	108	96	66
19		236	264	390	140	132	81	104	90	64
20		286	304	390	145	128	75	104	92	56
21		286	364	350	140	126	77	110	88	54
22		268	451	310	142	117	81	112	88	56
23		222	570	310	135	112	79	126	88	60
24		194	710	290	132	108	77	175	88	70
25		194	775	290	128	108	75	160	88	67
26	39	222	890	270	135	106	77	145	84	67
27	39	252	1,160	390	121	104	77	145	81	67
28	44	236	1,210	350	121	102	77	126	79	67
29	44	222	1,210	330	126	100	74	126	83	63
30	44	194	1,210	310	117	100	74	121	77	64
31	44	.....	1,110	.....	112	96	.....	117	.....	67

NOTE.—Discharge determined from two well-defined rating curves, one applicable June 5 to July 16, and the other for the remainder of the year. The use of two curves is due to the fact that two gages are read and not to a change in channel. (See footnote to daily gage heights.) Discharge interpolated June 4.

Monthly discharge of Birch Creek at Swift dam, near Dupuyer, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 26-31	44	39	42.3	503	A.
April	286	46	149	8,870	A.
May	1,210	132	462	28,400	A.
June	1,110	270	527	31,400	A.
July	290	112	172	10,600	A.
August	208	96	127	7,810	A.
September	96	74	81.4	4,840	A.
October	194	70	114	7,010	A.
November	121	77	97.5	5,800	A.
December	84	54	69.1	4,250	B.
The period	.....	.....	.....	109,000	

NOTE.—Accuracy for December reduced because a discharge measurement Jan. 3, 1914, plotted 0.05 foot from the curve, at a discharge of 56 second-feet, caused by presence of ice.

BIRCH CREEK NEAR DUPUYER, MONT.

Location.—In sec. 28, T. 29 N., R. 8 W., at Shield's ranch, 12 miles northwest of Dupuyer, Mont., and about 25 miles above the junction of Birch Creek with Two Medicine River.

Records available.—July 25, 1907, to December 31, 1913.

Drainage area.—186 square miles. (Revised from 155 square miles.)

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Gage.—Chain gage and a Bristol automatic. A temporary staff gage was put in July 23, 1908, about 200 feet below the site of the original gage, which had been washed out by the high water of June, 1908. The temporary gage was used until October 1, 1908, when a permanent chain gage was installed at a point about one-fourth mile farther upstream. A Bistol automatic gage was installed April 1, 1911, but the chain gage is still read daily.

Control.—Shifts at high stages.

Discharge measurements.—Made from a car and cable three-fourths miles below the gage; low-stage measurements made by wading just below the cable section.

Winter flow.—Affected by ice.

Diversions.—A number of ditches divert water for irrigation. The largest of these, owned by the Conrad Investment Co., diverts water about half a mile below the station.

Cooperation.—Gage heights and discharge measurements furnished by the engineers of the Valier-Montana Land & Water Co.

Discharge measurements of Birch Creek near Dupuyer, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 15	R. O. Crawford	a 5.67	55	June 27	L. B. Crossan	6.10	550
Feb. 17	do	a 6.56	100	July 2	do	5.59	310
Mar. 5	do	a 6.05	71	8	do	5.40	247
11	do	a 5.97	87	14	R. O. Crawford	5.16	201
Apr. 4	do	a 6.00	95	22	L. B. Crossan	5.00	173
16	do	5.06	202	Aug. 7	do	4.85	143
25	L. B. Crossan	5.11	205	12	do	5.08	186
May 2	do	5.01	199	19	R. M. Templeton	5.05	180
7	do	4.93	184	19	L. B. Crossan	5.05	186
16	R. O. Crawford	5.55	342	26	do	4.84	130
20	L. B. Crossan	5.43	304	Sept. 5	R. O. Crawford	4.73	107
22	do	5.78	438	10	do	4.70	95
23	R. O. Crawford	6.09	583	17	L. B. Crossan	4.63	79
24	L. B. Crossan	6.17	630	27	Templeton and Merrill	4.67	96
June 5	C. S. Heidel	6.71	839	Oct. 15	W. S. Merrill	5.00	170
12	R. O. Crawford	6.31	671	Dec. 4	do	4.83	76
20	L. B. Crossan	5.89	440	11	Templeton and Merrill	4.60	92
23	do	5.70	345				

a Ice present.

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Daily gage height, in feet, of Birch Creek near Dupuyer, Mont., for 1913.

[L. G. Kepple, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.5	6.3	5.7	5.4	5.1	7.0	5.65	4.9	4.8	4.65	4.9	4.75
2	5.4	6.3	5.85	5.45	5.15	7.2	5.6	4.9	4.75	4.65	4.9	4.8
3	5.3	6.3	6.0	5.75	5.1	6.8	5.55	5.05	4.75	4.65	4.85	4.8
4	5.2	6.4	5.9	6.1	4.95	6.7	5.5	5.05	4.75	4.75	4.85	4.8
5	4.9	6.4	6.0	6.2	4.9	6.6	5.5	4.9	4.75	4.7	4.85	4.85
6	4.95	6.4	6.1	6.2	4.9	6.5	5.5	5.1	4.75	4.7	4.9	4.85
7	.....	6.4	6.4	6.0	4.95	6.5	5.45	5.05	4.75	4.7	4.85	4.8
8	5.6	6.5	6.4	5.3	5.0	.....	5.4	5.05	4.75	4.7	4.8	4.8
9	5.4	6.6	6.2	4.5	5.0	6.6	5.3	5.35	4.75	4.65	4.8	4.75
10	4.95	6.6	6.1	4.5	5.1	6.5	5.3	5.5	4.75	4.65	4.8	4.7
11	5.4	6.6	5.95	4.65	5.45	6.4	5.3	5.25	4.7	4.7	4.8	4.65
12	5.35	6.5	5.9	4.75	5.5	6.4	5.25	5.15	4.7	4.8	4.85	4.6
13	5.3	6.7	5.85	4.9	5.55	6.2	5.25	5.15	4.7	5.1	4.8	4.65
14	5.65	6.7	6.0	5.05	5.5	6.2	5.15	5.15	4.65	5.15	4.8	4.65
15	5.65	6.6	6.1	5.1	5.5	.....	5.15	5.1	4.65	5.0	4.8	4.7
16	5.65	6.8	6.1	5.05	5.55	5.95	5.15	5.1	4.65	5.0	4.8	4.75
17	5.65	6.6	5.85	5.0	5.5	5.9	5.1	5.05	4.65	4.9	4.8	4.8
18	5.65	6.6	5.55	5.1	5.5	5.85	5.05	5.05	4.65	4.85	4.8	4.8
19	5.65	6.6	5.45	5.25	5.55	5.85	5.05	5.05	4.7	4.85	4.8	4.75
20	5.85	6.3	4.85	5.4	5.5	5.8	5.05	4.95	4.65	4.85	4.75	4.75
21	5.95	6.2	4.85	5.55	5.55	5.8	5.05	4.95	4.65	4.9	4.75	4.75
22	6.2	6.2	4.85	5.55	5.9	5.7	5.05	4.95	4.65	4.9	4.75	4.9
23	6.9	5.95	4.9	5.45	6.1	5.7	5.0	4.9	4.65	4.9	4.75	5.1
24	6.2	5.75	5.1	5.15	6.2	5.6	4.95	4.9	4.7	5.0	4.7	5.4
25	6.2	5.55	5.15	5.15	6.5	5.55	4.95	4.9	4.7	5.1	4.7	5.55
26	6.2	5.5	5.35	5.15	6.7	5.55	4.95	4.85	4.65	5.1	4.7	5.65
27	6.3	5.35	5.5	5.35	7.0	6.1	4.95	4.85	4.65	5.05	4.7	5.75
28	6.3	5.55	5.55	5.35	7.2	5.8	4.95	4.8	4.65	5.0	4.7	5.7
29	6.3	.....	5.4	5.1	7.2	5.7	4.95	4.8	4.65	4.95	4.75	5.75
30	6.4	.....	5.3	5.15	7.0	5.7	4.9	4.8	4.65	4.95	4.75	5.75
31	6.3	.....	5.2	.....	7.0	.....	4.9	4.8	.....	4.9	.....	5.75

NOTE.—Jan. 1 to Apr. 8 and Dec. 2-31, gage heights affected by ice.

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Daily discharge, in second-feet, of Birch Creek near Dupuyer, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	221	1,080	335	143	122	90	143	112
2	.....	233	1,200	315	143	112	90	143	.....
3	.....	221	940	295	176	112	90	132	.....
4	.....	186	860	280	176	112	112	132	.....
5	.....	175	784	275	143	112	101	132	.....
6	.....	175	740	270	188	112	101	147	.....
7	.....	186	740	260	176	112	101	132	.....
8	.....	198	760	245	176	112	101	122	.....
9	94	198	790	220	250	112	90	122	.....
10	94	221	760	225	204	112	90	122	.....
11	119	310	710	230	224	101	101	122	.....
12	136	325	720	220	200	101	122	132	.....
13	167	342	610	225	200	101	188	122	.....
14	200	325	610	200	200	90	200	122	.....
15	210	325	550	200	188	90	165	122	.....
16	200	342	485	200	188	90	165	122	.....
17	190	325	455	188	176	90	143	122	.....
18	210	325	425	176	176	90	132	122	.....
19	247	342	425	176	176	101	132	122	.....
20	285	325	400	176	154	90	132	112	.....
21	330	342	395	176	154	90	143	112	.....
22	330	490	350	176	154	90	143	112	.....
23	295	590	355	165	143	90	143	112	.....
24	215	640	320	154	143	101	165	101	.....
25	215	800	305	154	143	101	188	101	.....
26	215	910	305	154	132	90	188	101	.....
27	265	1,080	560	154	132	90	176	101	.....
28	270	1,200	410	154	122	90	165	101	.....
29	221	1,200	365	154	122	90	154	112	.....
30	233	1,080	360	143	122	90	154	112	.....
31	.....	1,080	.....	143	122	.....	143	.....	.....

NOTE.—Discharge determined as follows: Apr. 9–16, from a poorly defined rating curve; Apr. 17–28, by indirect method for shifting channels; Apr. 29 to June 2, from a fairly well-defined rating curve; June 3 to July 13, by indirect method for shifting channels; July 14 to Dec. 1, from a fairly well-defined rating curve; Apr. 1–8, estimated at 85 second-feet. Discharge interpolated for days for which gage heights are missing. A measurement Jan. 1, 1914, which showed a discharge of 103 second-feet, was used in making the estimates for December.

Monthly discharge of Birch Creek near Dupuyer, Mont., for 1913.

[Drainage area, 186 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	.....	.....	[a]60	0.323	0.37	3,690	D.
February	.....	.....	[a]72	.387	.40	4,000	D.
March	.....	.....	[a]76	.409	.47	4,670	D.
April	330	.....	181	.973	1.09	10,800	C.
May	1,200	175	475	2.55	2.94	29,200	B.
June	1,200	305	592	3.18	3.55	35,200	B.
July	335	143	208	1.12	1.29	12,800	B.
August	294	122	169	.909	1.05	10,400	B.
September	122	90	99.9	.537	.60	5,940	B.
October	200	90	136	.731	.84	8,360	B.
November	143	101	120	.645	.72	7,140	B
December	.....	.....	[b]95	.511	.59	5,840	C.
The year	1,200	.....	191	1.03	13.91	138,000	

[a] Estimated by Mr. Crawford, hydrographer for the Valier-Montana Land & Water Co.
[b] Estimated by the engineers of the United States Geological Survey.

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BIRCH CREEK AT HALL'S RANCH, NEAR DUPUYER, MONT.

Location.—At Hall's ranch, about 4 miles below the headgates of the "B" canal of the Valier Carey project. The station called "Birch Creek near Dupuyer" is situated a short distance above these headgates.

Record available.—May 16 to December 31, 1913.

Drainage area.—Not measured.

Gage.—Vertical staff.

Channel.—Gravelly and shifting.

Discharge measurements.—Made by wading.

Winter flow.—Affected by ice.

Diversions.—Greater part of flow diverted above station for irrigation.

Discharge measurements of Birch Creek at Hall's ranch, near Dupuyer, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 3	C. S. Heidel	[a] 1.10	64	July 11	L. B. Crossan	.50	22.7
15	L. B. Crossan	1.60	186	25	do	.60	31.4
May 3	R. O. Crawford and L. B. Crossan	1.65	188	Aug. 7	do	.70	46
				12	do	1.06	103
6	L. B. Crossan	1.42	168	Sept. 5	R. O. Crawford	0.25	5.42
16	R. O. Crawford	2.00	352	12	Crossan and Crawford	.23	5.88
21	L. B. Crossan	1.84	274	17	L. B. Crossan	.15	4.39
June 6	C. S. Heidel	1.95	313	27	Templeton and Merrill	[b] 0.81	3.57
20	L. B. Crossan	.41	16.6	Oct. 15	W. S. Merrill	1.48	154
26	do	.31	8.7	Dec. 3	do	1.20	103

[a] Ice present. [b] Back water from a small irrigation dam affected gage height.

Daily gage height, in feet, of Birch Creek at Hall's ranch, near Dupuyer, Mont., for 1913.

[John Hall and John Ryan, observers.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.8	0.45	0.5	0.4	.....	1.40	1.20
2	.....	2.75	.35	.55	.3	.....	1.37	1.15
3	.....	2.5	.3	.6	.3	0.57	1.35	1.10
4	.....	2.2	.3	.6	.25	.64	1.33	1.15
5	.....	2.1	.3	.8	.25	.62	1.31	1.18
6	.....	1.8	.3	.8	.2	.60	1.30	1.20
7	.....	1.5	.2	.95	.1	.60	1.30	1.18
8	.....	1.7	.2	1.0	.1	1.10	1.29	1.15
9	.....	1.6	.8	1.1	.1	1.11	1.29	1.12
0	.....	2.0	.6	1.2	.1	1.11	1.29	1.10
1	.....	1.75	.5	1.1	.1	1.40	1.30	1.10
2	.....	1.6	.5	1.1	.1	1.42	1.30	1.09
3	.....	1.45	.4	1.2	.0	1.50	1.25	1.08
4	.....	1.4	.35	1.25	.0	1.60	1.22	1.08
5	.....	1.0	.4	1.2	.1	1.48	1.20	1.16
6	2.0	.75	.4	1.3	.1	1.38	1.20	1.26
7	2.3	.6	.4	1.1	.15	1.31	1.20	1.35
8	2.0	.4	.3	1.2	.2	1.20	1.20	1.35
9	1.95	.3	.3	.9	.2	1.27	1.20	1.35
0	2.0	.4	.3	.85	.3	1.27	1.19	1.36
1	1.85	.4	.3	.8	.25	1.27	1.19	1.36
2	1.7	.3	.3	.8	.3	1.27	1.20	1.54
3	2.2	.3	.3	.7	.35	1.27	1.22	1.82
4	2.3	.4	.4	.65	.35	1.37	1.21	2.05
5	2.5	.4	.5	.6	.35	1.50	1.20	1.97
6	2.7	.3	.6	.6	.35	1.45	1.23	1.86
7	3.0	.3	.6	.5	.....	1.40	1.25	1.79
8	3.3	.6	.6	.45	.....	1.38	1.27	1.72
9	3.15	.6	.65	.4	.....	1.37	1.29	1.68
0	3.1	.4	.5	.4	.....	1.38	1.29	1.65
.....	2.9	.....	.5	.4	.....	1.39	.....	1.62

NOTE.—Gage heights Dec. 22 to 31 affected by ice.

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Daily discharge, in second-feet, of Birch Creek at Hall's ranch, near Dupuyer, Mont., for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	660	19	23	15	10	140	100
2	.....	635	12	28	8	15	134	92
3	.....	530	8	32	8	17	130	85
4	.....	410	8	32	6	24	126	92
5	.....	370	8	58	6	22	122	97
6	.....	270	8	58	5	20	120	100
7	.....	190	5	81	3	20	120	97
8	.....	240	5	89	3	85	118	92
9	.....	215	58	105	3	88	118	88
10	.....	330	32	125	3	86	118	85
11	.....	255	23	105	3	140	120	85
12	.....	215	23	105	3	144	120	84
13	.....	178	15	125	2	160	110	82
14	.....	165	12	135	2	180	104	82
15	.....	89	15	125	3	156	100	94
16	330	51	15	145	3	136	100	112
17	450	32	15	105	4	122	100	130
18	330	15	8	125	4	118	100	130
19	315	8	8	73	4	114	100	136
20	330	15	8	66	4	114	98	132
21	285	15	8	58	4	114	96	132
22	240	8	8	58	4	114	100	.....
23	410	8	8	44	4	114	104	.....
24	450	15	15	38	4	134	102	.....
25	530	15	23	32	4	160	100	.....
26	610	8	32	32	4	150	106	.....
27	760	8	32	23	4	140	110	.....
28	910	32	32	19	4	136	114	.....
29	835	32	38	15	4	134	118	.....
30	810	15	23	15	4	136	118	.....
31	710	.....	23	15	.....	138	.....	.....

NOTE.—Discharge determined as follows: To Sept. 17, from a rating curve well defined below 400 second-feet; Sept. 18 to Oct. 2, estimated from measurements; Oct. 3 to Dec. 21, from a fairly well defined rating curve; Dec. 22–31, estimated at 90 second-feet from the discharge Dec. 21, and a measurement Jan. 1, 1914, which gave a discharge of 64 second-feet.

Monthly discharge of Birch Creek at Hall's ranch, near Dupuyer, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 16–31	910	240	519	16,500	C.
June	660	8	168	10,000	B.
July	58	5	17.6	1,080	B.
August	145	15	67.4	4,140	B.
September	15	2	4.4	262	C.
October	180	10	104	6,400	B.
November	140	98	112	6,660	B.
December	.....	.....	97.5	6,000	C.
The period	.....	.....	.....	51,000	

NOTE.—Accuracy for July and August reduced on account of the large daily fluctuation as shown by comparison of observer's and hydrographer's readings for those months.

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DUPUYER CREEK NEAR VALIER, MONT.

Location.—In the NE. ¼ NW. ¼ sec. 33, T. 29 N., R. 6 W., at Cowell ranch, about 11 miles northwest of Valier; about 1,000 feet above a large diversion dam at the head of the canal from Dupuyer Creek to Lake Francis reservoir. The Birch Creek canal enters Dupuyer Creek below the gaging station and above the diversion dam.

Records available.—July 17 to 31, 1912; August 15, 1912, to December 31, 1913.

Drainage area.—Not measured.

Gage.—A standard chain gage an a Bristol automatic at the same section.

Control.—Shifts slightly.

Discharge measurements.—Made from a cable at high stages and by wading at medium and low stages.

Winter flow.—Affected by ice.

Diversions.—Numerous water appropriations recorded but many of the rights have never been used.

Accuracy.—Conditions good for obtaining accurate discharge data.

Cooperation.—Gage heights and most of the discharge measurements furnished by the engineers of the Valier-Montana Land & Water Co.

Discharge measurements of Dupuyer Creek near Valier, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 28	R. O. Crawford	[a] 3.96	22	June 19	L. B. Crossan	2.92	68
Feb. 18	do	[a] 4.34	28	27	do	3.62	263
Mar. 3	do	[a] 3.93	28	July 1	Crossan and Crawford	3.08	98
Apr. 5	C. S. Heidel	[a] 3.94	95	7	L. B. Crossan	2.86	56
7	do	[a] 3.57	107	15	R. O. Crawford	2.72	40
17	R. O. Crawford	3.19	112	18	L. B. Crossan	2.66	31
26	L. B. Crossan	3.01	80	Aug. 8	do	2.64	31
May 3	do	3.04	86	15	do	2.74	42
9	do	2.97	75	18	do	2.70	35
15	R. O. Crawford	3.03	90	30	do	2.45	11.8
20	L. B. Crossan	3.32	152	Sept. 12	Crossan and Crawford	2.41	10.5
23	do	3.41	178	18	L. B. Crossan	2.32	9.49
June 6	C. S. Heidel	3.36	156	Oct. 1	W. S. Merrill	2.47	13.8
10	L. B. Crossan	3.30	150	Dec. 16	do	2.72	28

[a] Ice present.

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Daily gage height, in feet, of Dupuyer Creek near Valier, Mont., for 1913.

[C. E. Crocker, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3.9	3.9	3.8	2.97	3.5	3.1	2.58	2.45	2.42	2.81	2.61
2	3.45	3.9	3.9	3.7	3.05	3.5	3.05	2.57	2.43	2.42	2.80	2.52
3	3.45	3.8	.....	3.7	3.05	3.5	2.99	2.57	2.42	2.41	2.78	.....
4	3.4	3.8	4.0	3.7	3.05	3.45	.....	2.55	2.40	.....	2.89	2.69
5	3.45	3.8	4.1	3.7	3.05	3.4	2.84	2.60	.....	2.68	2.84	.....
6	.....	4.1	4.1	3.8	.....	3.35	2.90	2.60	2.39	2.61	2.84	2.72
7	3.5	4.2	4.0	3.6	2.91	3.35	2.88	2.55	2.41	2.56	2.89	2.80
8	3.45	4.2	4.2	3.6	3.00	3.3	2.83	.....	2.40	2.60	2.80	2.78
9	.....	4.2	4.0	.....	2.98	3.35	2.84	2.72	2.40	2.62	2.72	.....
10	3.6	4.2	4.0	3.6	2.98	3.3	2.77	2.79	2.40	.....	2.76	2.83
11	3.6	.....	4.2	3.1	2.98	3.25	2.78	2.74	2.40	2.81	.....	2.80
12	3.6	4.1	.....	.....	2.95	3.25	2.76	2.68	2.40	2.93	2.72	2.74
13	3.45	3.9	3.8	3.15	3.08	3.2	2.74	2.66	.....	2.99	2.85	2.79
14	3.6	3.8	3.6	3.2	3.05	3.15	2.74	2.94	2.39	2.95	2.75	2.83
15	3.9	4.2	3.8	3.25	3.05	3.15	2.73	2.78	2.39	2.87	2.80	2.80
16	3.8	4.2	3.7	3.2	3.0	2.99	2.71	2.68	2.38	2.82	2.71	2.72
17	3.8	4.2	3.7	3.2	3.0	2.99	2.69	2.63	2.38	2.80	2.67	.....
18	.....	.....	3.6	3.15	3.1	2.97	2.68	2.65	2.37	2.76	2.65	2.52
19	3.8	4.2	3.5	3.15	3.45	2.92	2.63	2.62	2.38	2.74	2.68	2.58
20	3.8	4.1	3.6	3.2	3.3	3.05	2.63	2.62	.....	2.77	2.65	.....
21	3.8	4.1	3.7	3.2	3.25	2.94	2.62	.....	2.40	.....	.....	2.77
22	3.9	4.2	3.7	3.2	3.25	2.89	2.62	2.59	2.40	2.72	2.70	.....
23	3.9	4.0	3.7	3.1	3.35	2.89	2.63	.....	2.54	2.80	2.62	.....
24	.....	4.0	3.6	3.05	3.5	2.84	2.61	2.56	2.51	2.79	2.72	.....
25	3.9	3.9	3.5	3.05	3.5	.....	2.60	2.53	2.52	2.76	2.79	.....
26	3.9	3.8	3.45	3.0	3.6	2.94	2.63	2.51	2.51	2.78	2.68	.....
27	.....	3.8	3.45	3.1	3.6	3.6	2.66	2.51	.....	2.80	2.82	.....
28	3.9	3.8	3.45	3.15	3.7	3.45	2.62	2.50	2.45	2.78	2.83	.....
29	3.9	.....	3.6	3.05	3.7	3.25	2.60	2.48	.....	2.80	2.40	.....
30	3.9	.....	3.8	3.05	3.6	3.15	2.62	2.48	2.42	2.81	2.73	.....
31	4.0	.....	3.7	.....	3.6	.....	2.60	2.48	.....	2.78	.....	.....

NOTE.—Gage heights Jan. 1 to Apr. 10 and Nov. 27 to Dec. affected by ice. The results of the Bristol automatic gage in operation at this station were not very satisfactory and have not been used in obtaining daily gage heights.

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Daily discharge, in second-feet, of Dupuyer Creek near Valier, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	95	75	210	98	24	15	13	49
2	95	89	210	89	24	14	13	48
3	95	89	210	78	24	13	13	46
4	95	89	192	66	22	12	24	61
5	95	89	174	54	26	12	34	54
6	100	76	159	62	26	12	27	54
7	107	64	159	59	22	13	23	61
8	107	80	144	52	30	12	26	48
9	107	76	159	54	38	12	28	38
10	107	76	144	44	47	12	38	43
11	98	76	132	46	41	12	49	40
12	104	71	132	43	34	12	67	38
13	109	89	120	41	32	12	78	56
14	120	89	109	41	69	12	71	42
15	132	89	109	40	46	12	58	48
16	120	80	78	37	34	11	51	37
17	120	80	78	35	29	11	48	33
18	109	98	75	34	31	11	43	31
19	109	192	66	29	28	11	41	34
20	120	144	89	29	28	12	44	31
21	120	132	69	28	26	12	41	34
22	120	132	61	28	25	12	38	36
23	98	159	61	29	24	21	48	28
24	89	210	54	27	23	19	47	38
25	89	210	61	26	20	20	43	47
26	80	254	69	29	19	19	46	34
27	98	254	254	32	19	17	48	30
28	109	304	192	28	18	15	46	30
29	89	304	132	26	17	14	48	30
30	89	254	109	28	17	13	49	30
31	.....	254	.....	26	17	.....	46	.....

NOTE.—Discharge determined from a well-defined rating curve, which is the same as that used for 1912; discharge estimated Apr. 1–10 and Nov. 27 to 30; discharge interpolated for days for which gage heights are missing.

Monthly discharge of Dupuyer Creek near Valier, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	.....	[a] 23.0	1,410	D.
February	.....	.....	[a] 23.0	1,280	D.
March	.....	.....	[a] 36.0	2,210	D.
April	132	80	104	6,190	B.
May	304	64	138	8,480	A.
June	254	54	127	7,560	A.
July	98	26	43.2	2,660	A.
August	69	17	28.4	1,750	A.
September	21	11	13.5	803	A.
October	78	13	41.6	2,560	A.
November	61	28	40.9	2,430	B.
December	.....	.....	[b] 30.0	1,840	D.
The year	304	.....	54.1	39,200	

[a] Estimate by Mr. Crawford, hydrographer for the Valier-Montana Land & Water Co.
[b] Estimated by engineers of the United States Geological Survey. A measurement made Jan. 9, 1914, which showed a discharge of 32 second-feet, was used in making the estimate for December.

DRY FORK OF MARIAS RIVER NEAR VALIER, MONT.

Location.—In the SW. ¼ sec. 36, T. 29 N., R. 5 W., about 9 miles southeast of Valier and 5 miles south of the dam of the Lake Francis reservoir.

Records available.—March 19, 1911, to December 31, 1913.

Drainage area.—About 120 square miles.

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Gages.—Bristol automatic and an inclined staff gage on the left bank. The Bristol gage has a range of 8 feet.

Control.—Shifting; bed of stream composed of sand and gravel.

Discharge measurements.—At low and medium stages made by wading; during high stages it may be necessary to use floats.

Winter flow.—Affected by ice.

Diversions.—Appropriations amounting to nearly 1,200 second-feet have been filed on Dry Fork and its branches.

Cooperation.—Gage heights and discharge measurements furnished by the engineers of the Valier-Montana Land & Water Co.

Discharge measurements of Dry Fork of Marias River near Valier, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 30	R. O. Crawford		[a] 10	May 10	L. B. Crossan	2.25	21
Feb. 20	do	[b] 2.75	18.6	19	do	2.46	41
Mar. 7	do	[b] 2.96	15.3	June 11	do	1.85	3.6
28	do	[b] 2.52	3.1	18	do	1.70	.98
Apr. 2	L. B. Crossan	[b] 3.52	60	21	R. O. Crawford	1.99	6.4
2	C. S. Heidel	[b] 3.52	59	July 7	L. B. Crossan	1.90	2.6
8	L. B. Crossan	2.81	110	12	do	1.80	.93
14	do	2.64	72	21	do	1.72	.29
19	L. B. Crossan	2.31	24	Aug. 16	do	1.90	2.66
28	do	2.13	13.4	Sept. 24	do	1.65	e.2
May 5	do	2.40	33.0	Oct. 9	W. S. Merrill	1.78	1.04

[a] Discharge estimated. [b] Ice present.

Daily gage height, in feet, of Dry Fork of Marias River near Valier, Mont., for 1913.

[W. R. Hunt, observer.]

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.84	3.85	2.18	1.97	2.06	1.67	1.62	1.60	1.80	1.83
2	.....	2.94	3.45	2.24	1.93	2.02	1.69	1.64	1.60	1.80	1.82
3	.....	2.89	3.55	2.34	1.87	1.95	1.69	1.63	1.60	1.81	1.79
4	.....	2.89	3.25	2.40	1.84	1.93	1.69	1.63	1.60	1.82	1.75
5	.....	2.84	3.1	2.34	1.81	1.92	1.67	1.63	1.63	1.82	1.72
6	.....	2.99	3.45	2.29	1.81	1.90	1.66	1.65	1.70	1.85	1.69
7	.....	3.15	3.05	2.24	1.79	1.89	1.66	1.65	1.73	1.85	1.71
8	.....	3.4	2.81	2.22	1.80	1.90	1.70	1.65	.....	1.87	1.70
9	.....	3.35	2.71	2.23	1.81	1.88	1.78	1.66	1.78	1.86	1.70
10	.....	3.25	2.67	2.23	1.82	1.88	1.91	1.62	1.81	1.85	1.65
11	.....	3.2	2.68	2.24	1.84	1.81	.....	1.59	1.80	1.85	1.65
12	.....	3.4	2.67	2.24	1.80	1.80	.....	1.62	1.98	1.84	1.68
13	.....	2.84	2.64	2.25	1.80	1.80	.....	1.64	2.22	1.85	1.69
14	.....	2.94	2.60	2.27	1.79	1.80	.....	1.65	2.39	1.86	1.68
15	2.54	3.00	2.51	2.27	1.77	1.76	.....	1.64	2.24	1.90	1.70
16	2.79	2.94	2.42	2.26	1.76	1.75	1.88	1.64	2.12	1.90	1.70
17	2.99	2.79	2.37	2.29	1.74	1.73	1.80	1.64	2.05	1.86	1.70
18	2.59	2.64	2.36	2.34	1.73	1.74	1.79	1.64	1.96	1.81	1.72
19	2.49	2.59	2.32	2.56	1.72	1.75	1.76	1.65	1.90	1.80	1.75
20	2.79	2.54	2.33	2.86	1.82	1.73	1.71	1.65	1.94	1.82	1.80
21	2.64	2.54	2.31	2.62	1.97	1.72	1.68	1.65	1.95	1.81	1.80
22	2.59	2.54	2.28	2.52	1.94	1.71	1.67	1.66	1.90	1.82	1.82
23	2.54	2.49	2.22	2.47	1.88	1.71	1.65	1.68	1.86	1.80	1.85
24	2.54	2.44	2.20	.....	1.84	1.69	1.63	1.65	1.84	1.80	1.97
25	2.59	2.34	2.18	.....	1.80	1.73	1.62	1.60	1.81	1.80	2.10
26	2.44	2.44	2.18	.....	1.91	1.71	1.61	1.61	1.82	1.80	2.28
27	2.59	2.59	2.17	2.03	2.68	1.71	1.61	1.62	1.80	1.81	2.30
28	2.64	2.59	2.16	2.00	2.66	1.71	1.61	1.62	1.81	1.85	2.32
29	.....	2.64	2.16	2.01	2.31	1.71	1.62	1.60	1.80	1.88	2.43
30	.....	3.1	2.19	2.04	2.15	1.66	1.63	1.60	1.80	1.84	2.37
31	.....	3.5	.....	2.01	.....	1.64	1.63	.....	1.79	.....	2.49

NOTE.—Gage heights, Feb. 15 to Apr. 6 and Nov. 28 to Dec. 31, distorted by ice. Observer's records used up to Apr. 6; after that date mean daily Bristol record is used, applying proper corrections to reduce it to the datum of the staff gage.

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Daily discharge, in second-feet, of Dry Fork of Marias River near Valier, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	50	15.4	6.8	8.7	0.5	.....	.....	1.2
2	60	19.5	5.4	6.8	.6	.....	.....	1.2
3	80	28	3.7	4.3	.6	.....	.....	1.4
4	100	33	3.1	3.7	.6	.....	.....	1.5
5	120	28	2.5	3.4	.5	.....	.3	1.5
6	140	23	2.5	2.8	.5	.....	.6	2.0
7	170	19.5	2.2	2.6	.5	.....	.8	2.0
8	108	18.0	2.3	2.8	.6	.....	1.0	2.3
9	86	18.8	2.5	2.5	1.1	.....	1.1	2.2
10	78	18.8	2.7	2.5	3.1	.....	1.4	2.0
11	80	19.5	3.1	1.4	.....	.....	1.2	2.0
12	78	19.5	2.3	1.2	.....	.....	5.2	1.8
13	72	20	2.3	1.2	.....	.....	18.0	2.0
14	64	22	2.2	1.2	.....	.....	32	2.2
15	48	22	1.9	1.0	.....	.....	19.5	2.8
16	36	21	1.8	.9	2.5	.....	11.8	2.8
17	30	23	1.6	.8	1.2	.....	8.2	2.2
18	29	28	1.5	.8	1.1	.....	4.6	1.4
19	26	56	1.5	.9	1.0	.....	2.8	1.2
20	27	120	2.0	.8	.7	.....	4.0	1.5
21	25	68	6.4	.7	.5	.....	4.3	1.4
22	22	51	4.0	.7	.5	.....	2.8	1.5
23	18	44	2.6	.7	.4	.....	2.2	1.2
24	16.5	35	1.8	.6	.3	.....	1.8	1.2
25	15.3	26	1.3	.8	.....	.....	1.4	1.2
26	15.3	18.0	3.1	.7	.....	.....	1.5	1.2
27	14.7	9.4	80	.7	.....	.....	1.2	1.4
28	14.1	7.8	76	.7	.....	.....	1.4	1.2
29	14.1	8.3	25	.7	.....	.....	1.2	1.2
30	15.9	9.9	13.6	.4	.....	.....	1.2	1.2
31	.....	8.3	.....	.4	.....	.....	1.1	.....

NOTE.—Discharge determined as follows: Apr. 7 to May 19 and June 26 to Nov. 27, from a rating curve well defined between 3 and 310 second-feet and fairly well defined at other stages; May 20 to June 18, from a fairly well defined rating curve; June 19–25, by indirect method for shifting channels; Apr. 1–6 and Nov. 28–30, estimated. Discharge interpolated May 24–26. Discharge Aug. 11–15 estimated at 5.0 second-feet; Aug. 25–31 at zero flow; Sept. 1–30, at 0.2 second-foot; Oct. 1–4, at zero flow.

Monthly discharge of Dry Fork of Marias River near Valier, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	.....	[a] 1.0	61	D.
February	.....	.....	[a] 8.5	472	D.
March	.....	.....	[a] 13.8	848	D.
April	170	14.1	55.1	3,280	B.
May	120	7.8	27.7	1,700	B.
June	80	1.3	8.92	531	B.
July	8.7	.4	1.85	114	B.
August	.....	.0	1.35	83	B.
September	.....	.0	[b] .2	12	C.
October	32	.0	4.28	263	B.
November	2.8	1.2	1.66	99	B.
December	.....	.....	[b] 1.5	92	D.
The year	170	.0	10.4	7,560	

[a] Estimated by Mr. Crawford, hydrographer for the Valier-Montana Land and Water Co.
[b] Estimated by the engineers of the United States Geological Survey.

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TETON RIVER AT STRABANE, MONT.

Location.—In the SE. ¼ NE. ¼ sec. 35, T. 25 N., R. 7 W., on the highway bridge half a mile north of Peeble's ranch, 16 miles above Chouteau, Mont., at Strabane, post office.

Records available.—November 26, 1904, to December 31, 1906; January 16, 1908, to December 31, 1913.

Drainage area.—140 square miles.

Gage.—Standard chain gage fastened to upstream side of bridge near the center of the river, installed March 23, 1911; previous to that date several different gages and datums were used.

Control.—Shifts at high stages; current swift. Several channels at both low and high stages, but the main channel carries about 80 per cent of the flow at high stages and 85 per cent at low stages. The results show the total flow of all the channels.

Discharge measurements.—At flood stages made from bridge at the gage; at low stages by wading at various sections.

Winter flow.—Not affected by ice.

Diversions and storage.—Practically no water is diverted above the station, but the ordinary flow below the station is appropriated and used for irrigation. An irrigation project now being constructed under the Carey Act will store the flood water of Teton River in the reservoir about 5 miles north of the gaging station. The capacity of the reservoir is 106,700 acre-feet, and it can be increased to 210,000 acre-feet by raising the top of the dam 20 feet. The reservoir will serve 55,400 acres of land on the north side of the river. The water will be diverted half a mile above the gage.

Accuracy.—Accurate determination of discharge during high stages difficult because of shifting channel.

Discharge measurements of Teton River at Strabane, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 9	C. S. Heidel	2.84	32	July 31	C. S. Heidel	3.94	128
May 30	B. E. Jones	5.47	1,090	Aug. 27	B. E. Jones	3.79	104
June 11	C. S. Heidel	5.27	837	27	....do	3.79	104
24	B. E. Jones	4.52	359	Oct. 23	C. S. Heidel	3.73	78

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Daily gage height, in feet, of Teton River at Strabane, Mont., for 1913.

[Jas. Peebles, jr., observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.7	2.65	.....	2.75	3.5	5.6	4.75	3.95	3.75	3.65	3.75	3.7
2	2.7	2.7	.....	2.8	3.5	5.75	4.6	3.95	3.75	3.65	3.75	3.7
3	2.7	2.7	2.7	2.75	3.5	5.7	4.6	3.95	3.7	3.7	3.75	3.7
4	2.65	2.7	2.7	2.75	3.5	5.6	4.5	3.95	3.7	3.7	3.75	3.7
5	2.65	2.65	2.7	2.75	3.55	5.6	4.5	3.95	3.75	3.7	3.75	3.7
6	2.65	2.65	2.7	2.7	3.55	5.55	4.5	3.95	3.7	3.7	3.75	3.7
7	2.7	2.6	2.75	2.7	3.55	5.55	4.5	3.95	3.75	3.7	3.75	3.7
8	.....	2.6	2.8	2.82	3.5	5.45	4.45	3.9	3.75	3.7	3.75	3.7
9	.....	2.6	2.85	2.88	3.5	5.45	4.4	3.95	3.75	3.7	3.75	3.7
10	.....	2.65	2.9	2.9	3.55	5.35	4.35	4.0	3.75	3.7	3.75	3.7
11	2.65	2.65	2.9	2.9	3.6	5.3	4.3	4.0	3.75	3.7	3.75	3.65
12	2.65	2.65	2.85	2.95	3.6	5.3	4.3	3.95	3.75	3.75	3.75	3.65
13	2.65	2.7	2.85	3.05	3.7	5.2	4.25	3.95	3.7	3.8	3.75	3.65
14	2.6	2.7	2.8	3.1	3.9	5.1	4.25	3.95	3.7	3.8	3.75	3.65
15	2.6	2.7	2.8	3.25	3.8	4.9	4.2	3.95	3.7	3.8	3.75	3.65
16	2.6	2.75	2.8	3.25	3.8	4.9	4.15	3.95	3.7	3.8	3.75	3.65
17	2.6	2.8	2.8	3.25	3.8	4.85	4.15	3.95	3.7	3.8	3.75	3.65
18	2.6	2.85	2.85	3.25	3.9	4.85	4.15	3.9	3.7	3.8	3.7	3.65
19	2.55	2.85	2.85	3.25	3.9	4.85	4.15	3.9	3.7	3.8	3.7	3.6
20	2.55	2.85	2.85	3.3	4.0	4.85	4.15	3.9	3.7	3.75	3.7	3.6
21	2.55	2.8	2.85	3.3	4.0	4.8	4.15	3.85	3.7	3.7	3.7	3.6
22	2.55	2.8	2.8	3.35	4.2	4.7	4.15	3.85	3.75	3.7	3.7	3.5
23	2.55	2.75	2.8	3.4	4.2	4.7	4.15	3.8	3.7	3.7	3.7	3.5
24	2.6	2.7	2.8	3.45	4.3	4.5	4.1	3.8	3.7	3.7	3.7	3.49
25	2.6	2.7	2.85	3.4	4.95	4.5	4.1	3.8	3.7	3.7	3.7	3.48
26	2.6	2.7	2.8	3.45	5.15	4.65	4.05	3.8	3.65	3.75	3.7	3.48
27	2.6	.....	2.75	3.45	5.6	5.0	4.05	3.75	3.65	3.75	3.7	3.48
28	2.65	.....	2.7	3.45	5.7	5.0	4.0	3.75	3.7	3.75	3.7	3.48
29	2.65	.....	2.7	3.45	5.7	4.85	4.0	3.75	3.7	3.75	3.7	3.48
30	2.65	.....	2.7	3.5	5.55	4.7	3.95	3.75	3.7	3.75	3.7	3.50
31	2.6	.....	2.7	.....	5.55	.....	3.9	3.8	.....	3.75	.....	3.50

NOTE.—Jan. 8–10 and Feb. 27 to Mar. 2, river was gorged with ice below gage and no observations were reported by the observer.

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Daily discharge, in second-feet, of Teton River at Strabane, Mont., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	24	22	24	27	104	1,180	478	128	89	74	89	81
2	24	24	24	30	104	1,350	400	128	89	74	89	81
3	24	24	24	27	104	1,290	400	128	81	81	89	81
4	22	24	24	27	104	1,180	356	128	81	81	89	81
5	22	22	24	27	112	1,180	356	128	89	81	89	81
6	22	22	24	24	112	1,130	356	128	81	81	89	81
7	24	19	27	24	112	1,130	356	128	89	81	89	81
8	24	19	30	31	104	1,030	320	117	89	81	89	81
9	23	19	34	36	104	1,030	300	128	89	81	89	81
10	22	22	37	37	112	938	280	140	89	81	89	81
11	22	22	37	37	120	890	255	140	89	81	89	74
12	22	22	34	41	120	890	255	128	89	89	89	74
13	22	24	34	50	137	795	240	128	81	97	89	74
14	19	24	30	54	176	710	240	128	81	97	89	74
15	19	24	30	70	155	565	230	128	81	97	89	74
16	19	27	30	70	155	565	205	128	81	97	89	74
17	19	30	30	70	155	535	205	128	81	97	89	74
18	19	34	34	70	176	535	205	117	81	97	81	74
19	17	34	34	70	176	535	205	117	81	97	81	67
20	17	34	34	76	200	535	205	117	81	89	81	67
21	17	30	34	76	200	505	195	107	81	81	81	67
22	17	30	30	83	252	450	195	107	89	81	81	55
23	17	27	30	90	252	450	195	97	81	81	81	55
24	19	24	30	97	284	356	185	97	81	81	81	54
25	19	24	34	90	600	356	185	97	81	81	81	53
26	19	24	30	97	752	425	152	97	74	89	81	53
27	19	24	27	97	1,180	635	152	89	74	89	81	53
28	22	24	24	97	1,290	635	140	89	81	89	81	53
29	22	.....	24	97	1,290	535	140	89	81	89	81	53
30	22	.....	24	104	1,130	450	128	89	81	89	81	55
31	19	.....	24	.....	1,130	.....	117	97	.....	89	.....	55

NOTE.—Discharge determined as follows: Jan. 1 to July 7 from a fairly well defined rating curve; July 8–25, by indirect method for shifting channels; July 26 to Dec. 31, from a fairly well defined rating curve. Discharge interpolated Jan. 8–10 and Feb. 27 to Mar. 2.

Monthly discharge of Teton River at Strabane, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	24	17	20.6	1,270	C.
February	34	19	25.0	1,390	C.
March	37	24	29.4	1,810	C.
April	104	24	60.9	3,620	B.
May	1,290	104	355	21,800	B.
June	1,350	356	760	45,200	B.
July	478	117	246	15,100	B.
August	140	89	116	7,130	B.
September	89	74	83.2	4,950	B.
October	97	74	86.2	5,300	B.
November	89	81	85.5	5,090	B.
December	81	53	69.1	4,250	B.
The year	1,350	17	162	117,000	

NOTE—Accuracy for January, February, and March reduced because of the possible effect of ice.

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TETON RIVER NEAR CHOUTEAU, MONT.

Location.—At the highway bridge about half a mile above the mouth of Deep Creek and 1 mile south of Chouteau, Mont.

Records available.—November 30, 1904, to July 31, 1906; May 27 to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff, fastened to pier on the downstream side near the left bank.

Control.—Gravel; shifting.

Discharge measurements.—At high stages measurements made from bridge at the gage; at low stages by wading near gage.

Winter flow.—Affected by ice.

Diversions.—Water is diverted both above and below the gage and the total flow has been filed on for irrigation.[1]

Accuracy.—Owing to the shifting of the channel several discharge measurements are required each year to insure good results.

Discharge measurements of Teton River near Chouteau, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
May 27	B. E. Jones	5.07	574	July 30	C. S. Heidel	2.48	8.2
June 11	C. S. Heidel	5.00	712	Aug. 26	B. E. Jones	2.36	3.4
26	B. E. Jones	3.85	218	Oct. 22	C. S. Heidel	2.90	37

Daily gage height, in feet, of Teton River near Chouteau, Mont., for 1913.

[C. D. Yeager, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	5.65	4.1	2.38	2.35	2.55	2.95	3.0
2	.....	5.7	4.0	2.38	2.35	2.55	2.95	3.0
3	.....	5.75	4.0	2.35	2.35	2.6	2.95	3.0
4	.....	5.8	3.95	2.35	2.35	2.65	3.0	3.02
5	.....	5.1	3.95	2.35	2.35	2.7	3.0	3.02
6	.....	4.9	3.9	2.32	2.35	2.75	3.0	3.02
7	.....	4.8	3.9	2.32	2.35	2.8	3.0	.....
8	.....	5.0	3.8	2.32	2.35	2.9	3.0	.....
9	.....	5.1	3.75	2.30	2.35	3.0	3.0	.....
10	.....	5.15	3.7	2.30	2.38	3.2	3.0	.....
11	.....	5.0	3.6	2.30	2.35	3.3	3.1	.....
12	.....	4.95	3.5	2.30	2.35	3.35	3.05	.....
13	.....	4.9	3.4	2.30	2.35	3.2	3.0	.....
14	.....	4.8	3.3	2.30	2.35	3.1	3.0	.....
15	.....	4.65	3.25	2.30	2.35	3.0	3.0	.....
16	.....	4.4	3.1	2.30	2.35	2.9	3.0	.....
17	.....	4.3	3.15	2.33	2.35	2.9	3.0	.....
18	.....	4.2	3.0	2.33	2.35	2.9	3.0	.....
19	.....	4.2	2.9	2.32	2.35	3.0	3.0	.....
20	.....	4.2	2.8	2.30	2.4	2.85	3.0	.....
21	.....	4.1	2.7	.....	2.4	2.85	3.0	.....
22	.....	4.1	2.65	.....	2.4	2.9	3.0	.....
23	.....	4.0	2.6	.....	2.45	2.9	3.0	.....
24	.....	3.9	2.6	.....	2.45	2.9	3.0	.....
25	.....	3.95	2.6	.....	2.45	2.9	3.0	.....
26	.....	4.0	2.6	2.35	2.45	2.9	3.0	.....
27	5.05	4.7	2.55	2.35	2.5	2.9	3.0	.....
28	5.3	4.4	2.5	2.35	2.5	2.9	3.0	.....
29	5.7	4.3	2.5	2.35	2.5	2.9	3.0	.....
30	5.55	4.2	2.45	2.35	2.5	2.95	3.0	.....
31	5.6	.....	2.4	2.35	.....	2.95	.....	.....

[1] See also description of Teton River near Strabane.

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Daily discharge, in second-feet, of Teton River near Chouteau, Mont., for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	929	304	4.2	3.0	12	44	49
2	.....	968	268	4.2	3.0	12	44	49
3	.....	1,010	268	3.0	3.0	15	44	49
4	.....	1,050	252	3.0	3.0	18	49	51
5	.....	713	252	3.0	3.0	22	49	51
6	.....	627	235	1.8	3.0	26	49	51
7	.....	588	235	1.8	3.0	30	49	.....
8	.....	694	205	1.8	3.0	39	49	.....
9	.....	752	191	1.0	3.0	49	49	.....
10	.....	786	177	1.0	4.2	73	49	.....
11	.....	713	151	1.0	3.0	88	60	.....
12	.....	689	127	1.0	3.0	97	54	.....
13	.....	665	106	1.0	3.0	73	49	.....
14	.....	617	88	1.0	3.0	60	49	.....
15	.....	546	80	1.0	3.0	49	49	.....
16	.....	429	60	1.0	3.0	39	49	.....
17	.....	385	66	2.2	3.0	39	49	.....
18	.....	343	49	2.2	3.0	39	49	.....
19	.....	343	39	1.8	3.0	49	49	.....
20	.....	343	30	1.0	5.0	34	49	.....
21	.....	304	22	1.0	5.0	34	49	.....
22	.....	304	18	1.5	5.0	39	49	.....
23	.....	268	15	2.0	7.5	39	49	.....
24	.....	235	15	2.5	7.5	39	49	.....
25	.....	252	15	3.0	7.5	39	49	.....
26	.....	268	15	3.0	7.5	39	49	.....
27	564	569	12	3.0	10	39	49	.....
28	699	429	10	3.0	10	39	49	.....
29	900	385	10	3.0	10	39	49	.....
30	850	343	7.5	3.0	10	44	49	.....
31	889	.....	5.0	3.0	.....	44	.....	.....

NOTE.—Discharge determined as follows: May 27 to June 9 by indirect method for shifting channels; June 10 to Dec. 6 from a fairly well defined rating curve; Aug. 21–25, interpolated.

Monthly discharge of Teton River near Chouteau, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 27–31	909	564	782	7,760	C.
June	1,050	235	552	32,800	C.
July	304	5.0	107	6,580	B.
August	4.2	1.0	2.13	131	C.
September	10	3.0	4.77	284	C.
October	97	12	41.8	2,570	B.
November	60	44	49.0	2,920	B.
December 1–6	51	49	50	595	B.
The period	.....	.....	.....	53,600	

NOTE.—Accuracy for August and September reduced on account of smallness of the discharge which tends to increase the percentage of error.

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SPRING CREEK NEAR STRABANE, MONT.

Location.—About 200 feet above the highway bridge half a mile south of Strabane post office.

Records available.—May 30 to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff, nailed to a post near the left bank.

Control.—Shifts gradually during summer months as a result of growth of moss.

Discharge measurements.—Made by wading at the bridge below the gage.

Winter flow.—Affected by ice only during extremely cold periods.

Diversions.—None.

Accuracy.—Results should be good if sufficient discharge measurements are made each year to show the extent of the shift.

Discharge measurements of Spring Creek near Strabane, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
May 30	B. E. Jones	4.05	13.5	July 31	C. S. Heidel	3.73	1.2
June 11	C. S. Heidel	3.84	3.6	Aug. 27	B. E. Jones	3.75	.77
23	B. E. Jones	3.82	2.5	Oct. 22	C. S. Heidel	3.91	5.0

Daily gage height, in feet, of Spring Creek near Strabane, Mont., for 1913.

[Jas. Peebles, jr., observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	4.0	4.22	3.74	3.75	3.8	3.9	3.87
2	.....	4.0	4.1	3.74	3.75	3.8	3.9	3.87
3	.....	4.0	4.0	3.73	3.75	3.8	3.9	3.87
4	.....	3.95	3.9	3.73	3.75	3.8	3.9	3.87
5	.....	3.9	3.9	3.73	3.74	3.8	3.9	3.87
6	.....	3.9	3.9	3.73	3.74	3.9	3.9	3.87
7	.....	3.9	3.9	3.73	3.74	3.9	3.9	3.85
8	.....	3.9	3.88	3.78	3.74	3.9	3.91	3.85
9	.....	3.9	3.88	3.78	3.74	3.9	3.91	3.85
10	.....	3.9	3.88	3.74	3.74	3.9	3.91	3.85
11	.....	3.83	3.86	3.74	3.74	3.9	3.91	3.84
12	.....	3.83	3.84	3.74	3.74	3.9	3.9	3.84
13	.....	3.83	3.83	3.73	3.74	3.88	3.9	3.84
14	.....	3.82	3.82	3.73	3.74	3.88	3.9	3.84
15	.....	3.82	3.81	3.73	3.75	3.88	3.9	3.84
16	.....	3.82	3.81	3.73	3.75	3.87	3.9	3.84
17	.....	3.82	3.8	3.73	3.75	3.86	3.9	3.85
18	.....	3.82	3.8	3.73	3.75	3.86	3.9	3.85
19	.....	3.81	3.78	3.73	3.75	3.86	3.9	3.85
20	.....	3.81	3.78	3.73	3.75	3.88	3.9	3.85
21	.....	3.81	3.77	3.73	3.75	3.90	3.89	3.85
22	.....	3.81	3.77	3.73	3.81	3.91	3.89	3.85
23	.....	3.81	3.76	3.72	3.8	3.91	3.88	3.85
24	.....	3.82	3.76	3.72	3.8	3.91	3.88	3.86
25	.....	3.82	3.76	3.72	3.8	3.92	3.88	3.86
26	.....	4.05	3.76	3.72	3.79	3.92	3.88	3.86
27	.....	4.32	3.75	3.75	3.79	3.92	3.88	3.87
28	.....	4.32	3.75	3.75	3.79	3.91	3.88	3.87
29	.....	4.30	3.75	3.75	3.8	3.91	3.88	3.87
30	.....	4.28	3.75	3.75	3.8	3.91	3 87	3.86
31	4.0	.....	3.75	3.75	.....	3.91	.....	3.86

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Daily discharge, in second-feet, of Spring Creek near Strabane, Mont., for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		10	28	1.2	0.8	1.7	4.7	3.7
2		10	17	1.2	.8	1.7	4.7	3.7
3		10	10	1.0	.8	1.7	4.7	3.7
4		7.6	5.4	1.0	.8	1.7	4.7	3.7
5		5.4	5.4	1.0	.7	1.7	4.7	3.7
6		5.4	5.4	1.0	.7	4.7	4.7	3.7
7		5.4	5.4	1.0	.7	4.7	4.7	3.0
8		5.4	4.7	2.0	.7	4.7	5.1	3.0
9		5.4	4.7	2.0	.7	4.7	5.1	3.0
10		5.4	4.7	1.2	.7	4.7	5.1	3.0
11		3.1	4.0	1.0	.7	4.7	5.1	2.7
12		3.1	3.3	1.0	.7	4.7	4.7	2.7
13		3.1	3.1	.8	.7	4.0	4.7	2.7
14		2.8	2.8	.8	.7	4.0	4.7	2.7
15		2.8	2.6	.8	.8	4.0	4.7	2.7
16		2.8	2.6	.8	.8	3.7	4.7	2.7
17		2.8	2.3	.8	.8	3.3	4.7	3.0
18		2.8	2.3	.7	.8	3.3	4.7	3.0
19		2.6	1.9	.7	.8	3.3	4.7	3.0
20		2.6	1.9	.7	.8	4.0	4.7	3.0
21		2.6	1.8	.7	.8	4.7	4.4	3.0
22		2.6	1.8	.7	2.0	5.1	4.4	3.0
23		2.6	1.6	.6	1.7	5.1	4.0	3.0
24		2.8	1.6	.6	1.7	5.1	4.0	3.3
25		2.8	1.6	.6	1.7	5.5	4.0	3.3
26		13.4	1.6	.5	1.5	5.5	4.0	3.1
27		38	1.4	.8	1.5	5.5	4.0	3.7
28		38	1.4	.8	1.5	5.1	4.0	3.7
29		36	1.4	.8	1.7	5.1	4.0	3.7
30		34	1.4	.8	1.7	5.1	3.7	3.1
31	10	.....	1.4	.8	.....	5.1	.....	3.1

NOTE.—Discharge determined as follows: Previous to Aug. 1, from a fairly well defined rating curve; Aug. 1-26, by indirect method for shifting channels; after Aug. 26, from a fairly well defined rating curve.

Monthly discharge of Spring Creek near Strabane, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
June	38	2.6	9.04	538	B.
July	28	1.4	4.34	267	B.
August	2.0	.5	.92	56.6	B.
September	2.0	.7	1.03	61.3	B.
October	5.5	1.7	4.13	254	B.
November	5.1	3.7	4.54	270	B.
December	3.7	2.7	3.19	196	B.
The period	.....	.....	.....	1,640	

NOTE.—The shift during August was gradual, so that the records for that period are considered good.

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DEEP CREEK NEAR CHOUTEAU, MONT.

Location.—In the SW. ¼ NW. ¼ sec. 15, T. 23 N., R. 5 W., at Hugh Robinson's ranch, 5 miles southwest of Chouteau, Mont.
Records available.—March 24, 1911, to December 31, 1913.
Drainage area.—Not measured.
Gage.—Overhanging chain on right bank.
Control.—Gravel bar about 50 feet below gage. Channel clean and fairly permanent; bed composed of gravel.
Discharge measurements.—Made by wading.
Winter flow.—Affected by ice.
Diversions.—A few small ditches divert water from the creek.
Accuracy.—Records good.

Discharge measurements of Deep Creek near Chouteau, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 28	B. E. Jones	7.19	542
June 25	do	6.22	144
Aug. 28	do	5.56	28
Nov. 7	W. A. Lamb	5.71	48

Daily gage height, in feet, of Deep Creek near Chouteau, Mont., for 1913.

[Hugh Robinson, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
.....	.....	6.01	6.06	7.2	6.38	5.66	5.49	5.33	5.67
.....	.....	5.88	6.16	7.15	6.33	5.66	5.49	5.33	5.67
.....	.....	6.04	6.16	7.15	6.23	5.66	5.49	5.33	5.67
.....	.....	5.96	6.11	7.15	6.23	5.64	5.49	5.33	5.63
.....	.....	6.26	6.16	7.0	6.17	5.61	5.44	5.48	5.63
.....	.....	6.26	6.11	6.95	6.17	5.64	5.44	5.68	5.63
.....	.....	6.26	6.11	6.8	6.12	5.64	5.44	5.58	5.63
.....	.....	6.16	6.06	6.9	6.07	5.61	5.44	5.63	5.60
.....	.....	6.11	6.06	6.85	6.07	5.71	5.44	5.53	5.6
.....	.....	6.08	6.06	6.85	6.02	5.70	5.44	5.58	5.6
.....	.....	6.08	6.06	6.8	6.02	5.70	5.44	5.68	5.6
.....	.....	6.16	6.16	6.65	5.97	5.67	5.44	6.13	5.65
.....	.....	6.06	6.16	6.75	5.97	5.65	5.44	6.13	5.6
.....	.....	6.06	6.21	6.65	5.97	5.65	5.39	6.03	5.55
.....	.....	6.06	6.16	6.55	5.92	5.65	5.39	5.83	5.5
.....	.....	6.01	6.16	6.45	5.92	5.65	5.34	5.72	5.6
.....	.....	5.96	6.11	6.40	5.87	5.63	5.29	5.67	5.7
.....	.....	5.96	6.21	6.38	5.82	5.65	5.29	5.62	5.6
.....	.....	5.96	6.65	6.38	5.82	5.63	5.29	5.67	5.55
.....	.....	6.06	6.50	6.48	5.77	5.63	5.29	5.72	5.55
.....	.....	6.06	6.31	6.33	5.77	5.60	5.31	5.72	5.6
.....	.....	6.16	6.26	6.28	5.76	5.65	5.31	5.72	5.6
.....	.....	6.11	6.50	6.23	5.76	5.63	5.33	5.72	5.55
.....	.....	6.01	6.55	6.23	5.71	5.60	5.33	5.67	5.55
.....	.....	6.01	6.7	6.18	5.71	5.60	5.28	5.73	5.55
.....	.....	5.96	6.8	6.33	5.71	5.57	5.33	5.67	5.55
.....	.....	5.96	7.0	7.15	5.71	5.55	5.33	5.73	5.65
.....	.....	6.06	7.2	7.15	5.71	5.54	5.33	5.73	5.56
.....	.....	6.06	7.3	6.70	5.66	5.54	5.33	5.73	5.61
.....	6.14	6.06	7.45	6.46	5.66	5.52	5.31	5.67	5.61
.....	6.04	.....	7.25	.....	5.66	5.52	.....	5.67	.....

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Daily discharge, in second-feet, of Deep Creek near Chouteau, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1		98	109	515	190	40	23	14	41
2		72	132	491	176	40	23	14	41
3		105	132	491	150	40	23	14	41
4		88	120	491	150	37	23	14	36
5		158	132	421	135	34	20	23	36
6		158	120	399	135	37	20	42	36
7		158	120	335	123	37	20	31	36
8		132	109	377	111	34	20	36	33
9		120	109	356	111	45	20	27	33
10		114	109	356	100	44	20	31	33
11		114	109	335	100	44	20	42	33
12		132	132	278	90	41	20	125	36
13		109	132	316	90	38	20	125	33
14		109	145	278	90	38	16	103	36
15		109	132	244	80	38	16	63	34
16		98	132	212	80	38	14	47	33
17		88	120	196	71	36	12	41	41
18		88	145	190	62	38	12	35	33
19		88	278	190	62	36	12	41	36
20		109	227	221	54	36	12	47	36
21		109	171	176	54	33	12	47	33
22		132	158	163	52	38	12	47	33
23		120	227	150	52	36	14	47	36
24		98	244	150	45	33	14	41	36
25		98	296	137	45	33	11	48	36
26		88	335	176	45	30	14	41	36
27		88	421	491	45	28	14	48	34
28		109	515	491	45	28	14	48	36
29		109	565	296	40	28	14	48	34
30	128	109	644	215	40	26	12	41	34
31	105		540		40	26		41	

NOTE.—Discharge determined from a rating curve well defined above 20 second-feet.

Monthly discharge of Deep Creek near Chouteau, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	158	72	110	6,550	A.
May	644	109	221	13,600	A.
June	515	137	305	18,100	A.
July	190	40	85.9	5,280	A.
August	45	26	35.8	2,200	A.
September	23	11	16.6	988	B.
October	125	14	45.5	2,800	A.
November	44	24	33.4	1,990	A.
The period				51,510	

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WILLOW CREEK NEAR CHOUTEAU, MONT.

Location.—In sec. 14, T. 23 N., R. 6 W., at McPhee's ranch, 12 miles southwest of Chouteau, Mont.

Record available.—April 2, 1912, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff gage on left bank. Low-water section reads to 5.00 feet; high-water section reads 5.00 to 9.00 feet.

Control.—Fairly permanent.

Discharge measurements.—Made by wading at the gage, except at extreme high stages, when they may be made from a bridge half a mile below the gage.

Winter flow.—Affected by ice; probably little flow.

Diversions.—Several diversions above the station, mostly to water hay land; not much water used except during very dry spells.

Accuracy.—Conditions good for obtaining accurate discharge data.

Discharge measurements of Willow Creek near Chouteau, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 28	B. E. Jones	2.75	127
June 25	do	1.82	20.0
Aug. 28	do	1.37	.93
Nov. 7	W. A. Lamb	1.69	13.4

NOTE.—Aug. 28, the point of zero flow was estimated at gage height 1.25 feet.

Daily gage height, in feet, of Willow Creek near Chouteau, Mont., for 1913.

[S. A. McPhee, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.30	2.10	2.70	2.10	1.5	1.32	1.45	1.72	1.58
2	2.25	2.10	2.60	2.02	1.50	1.32	1.48	1.72	1.60
3	2.15	2.12	2.50	2.00	1.88	1.32	2.50	1.70	1.62
4	2.10	2.15	2.40	1.95	1.45	1.30	1.5	1.68	1.62
5	2.25	2.15	2.30	1.9	1.45	1.3	.....	1.68	1.62
6	2.60	2.12	2.25	1.85	1.45	1.3	.....	1.65	1.60
7	2.60	2.12	2.22	1.8	1.42	1.3	1.55	1.65	.....
8	2.50	2.02	2.22	1.75	1.68	1.3	1.58	1.65	.....
9	2.45	2.08	2.20	1.7	1.62	1.3	1.60	1.68	.....
10	2.48	2.05	2.1	1.65	1.62	1.3	1.62	1.70	.....
11	2.30	2.05	2.1	1.65	1.60	1.3	1.68	1.72	.....
12	2.30	2.10	2.05	1.62	1.60	1.3	1.68	1.70	.....
13	2.28	2.08	2.05	1.62	1.58	1.30	1.75	1.70	.....
14	2.30	2.10	2.02	1.60	1.58	1.28	1.75	1.68	.....
15	2.35	2.05	1.95	1.6	1.65	1.25	1.85	1.68	.....
16	2.18	2.00	1.88	1.60	1.70	1.25	1.88	1.68	.....
17	.....	2.08	1.85	1.58	1.68	.....	1.80	1.70	.....
18	2.20	2.08	1.82	1.58	1.65	.....	1.80	1.7	.....
19	2.18	2.90	1.80	1.55	1.6	.....	1.82	1.7	.....
20	2.25	2.65	1.9	1.52	1.55	.....	1.85	1.7	.....
21	2.20	2.55	1.75	1.50	1.5	.....	1.88	1.7	.....
22	2.15	2.55	1.72	1.55	1.50	.....	1.75	1.7	.....
23	2.00	3.50	1.70	1.52	1.48	1.25	1.75	1.7	.....
24	1.98	2.60	1.7	1.60	1.45	1.25	1.72	1.70	.....
25	2.00	2.60	1.8	1.6	1.45	1.28	1.72	1.68	.....
26	2.00	2.50	2.1	1.65	1.42	1.30	1.75	1.65	.....
27	2.05	2.60	3.25	1.60	1.40	1.35	1.75	1.65	.....
28	2.02	2.70	3.12	1.52	1.38	1.40	1.78	1.62	.....
29	2.05	3.30	2.7	1.55	1.38	1.42	1.78	1.60	.....
30	2.08	3.00	2.2	1.52	1.35	1.45	1.75	1.58	.....
31	.....	2.80	.....	1.52	1.35	.....	1.72	.....	.....

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Daily discharge, in second-feet, of Willow Creek near Chouteau, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	68	46	123	46	5	0.6	3.0	15	8.2
2	62	46	107	38	5	.6	4.2	15	9
3	52	48	93	36	26	.6	5	14	10
4	46	52	80	32	3.0	.5	5	13	10
5	62	52	68	27	3.0	.5	5	13	10
6	107	48	62	24	3.0	.5	7	12	9
7	107	48	59	20	1.8	.5	7	12	.....
8	93	38	59	17	13	.5	8	12	.....
9	86	44	57	14	10	.5	9	13	.....
10	90	41	46	12	10	.5	10	14	.....
11	68	41	46	12	9	.5	13	15	.....
12	68	46	41	10	9	.5	13	14	.....
13	66	44	41	10	8.2	.5	17	14	.....
14	68	46	38	9	8.2	.4	17	13	.....
15	74	41	32	9	12	.2	24	13	.....
16	55	36	26	9	14	.2	26	13	.....
17	56	44	24	8.2	13	.1	20	14	.....
18	57	44	21	8.2	12	.1	20	14	.....
19	55	158	20	7	9	.1	21	14	.....
20	62	115	27	5.8	7	.1	24	14	.....
21	57	100	17	5	5	.1	26	14	.....
22	52	100	15	7	5	.1	17	14	.....
23	36	93	14	5.8	4.2	.2	17	14	.....
24	34	107	14	9	3.0	.2	15	14	.....
25	36	107	20	9	3.0	.4	15	13	.....
26	36	93	46	12	1.8	.5	17	12	.....
27	41	107	226	9	1.0	.8	17	12	.....
28	38	123	199	5.8	.9	1.0	19	10	.....
29	41	237	123	7	.9	1.8	19	9	.....
30	44	176	57	5.8	.8	3.0	17	8.2	.....
31	.....	140	.....	5.8	.8	.....	15	.....	.....

NOTE.—Discharge determined from a rating curve fairly well defined between 1.0 second-feet and 2.5 second-feet. Discharge estimated Sept. 17–22. Discharge interpolated for days for which gage heights are missing.

Monthly discharge of Willow Creek near Chouteau, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	107	34	60.6	3,610	B.
May	237	36	79.4	4,880	B.
June	226	14	60.0	3,570	B.
July	46	5	14.0	861	B.
August	26	0.8	6.70	412	B.
September	3	.1	.54	32	C.
October	26	3	14.6	898	B.
November	15	8.2	13.0	774	B.
December 1–6	10	8.2	9.37	112	B.
The period	.....	.....	.....	15,100	

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MUDDY CREEK NEAR BYNUM, MONT.

Location.—In the NW. ¼ SE. ¼ sec. 22, T. 26 N., R. 6 W., just above the mouth of Blackleaf Creek and 2 miles above Bynum.

Records available.—May 24, 1912, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Overhanging chain gage on the left bank.

Control.—Shifts at all stages.

Discharge measurements.—Made by wading near the gage.

Winter flow.—Affected by ice.

Diversions.—Summer flow is appropriated and used; flood waters have been filed on by the Teton Cooperative Reservoir Co.

Accuracy.—Frequent discharge measurements are necessary to insure good results.

Discharge measurements of Muddy Creek near Bynum, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 9	C. S. Heidel	2.52	26.8	July 31	C. S. Heidel	2.01	1.5
May 29	B. E. Jones	2.73	89	Aug. 27	B. E. Jones	1.96	.22
June 11	C. S. Heidel	2.28	11.4	Oct. 23	C. S. Heidel	2.00	.73
24	B. E. Jones	2.25	3.4				

Daily gage height, in feet, of Muddy Creek near Bynum Mont., for 1913.

[H. Fligger, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.5	.....	2.45	2.3	2.0	1.95	2.0	2.0	2.0
2	.....	2.5	2.35	2.4	2.3	2.0	1.9	2.0	2.0	2.0
3	.....	2.4	2.35	2.4	2.3	2.0	1.9	2.0	2.05	2.0
4	.....	2.4	2.4	.....	2.3	2.0	1.9	2.0	2.05	2.0
5	.....	2.4	2.4	2.45	2.2	2.0	1.9	.....	2.0	2.0
6	.....	2.45	2.3	2.4	2.2	2.0	1.9	2.05	2.0	2.0
7	.....	2.45	2.35	2.4	2.1	2.0	1.9	2.1	2.0	2.0
8	.....	2.5	2.35	2.4	2.1	1.95	1.9	2.05	2.0	2.0
9	.....	.....	.....	2.3	2.1	1.9	1.9	2.05	2.0	2.0
10	.....	2.45	2.35	2.3	2.0	1.9	1.9	2.05	2.0	2.0
11	.....	.....	2.3	2.3	2.1	1.9	1.9	2.05	2.0	2.0
12	.....	2.45	2.3	2.3	2.1	1.9	1.9	2.05	2.05	2.0
13	.....	2.45	2.3	2.25	2.1	1.9	1.9	2.05	2.05	2.0
14	.....	2.45	2.25	2.25	2.1	1.8	1.9	2.05	2.05	2.0
15	.....	2.45	2.25	2.25	2.1	1.8	1.95	2.0	2.05	2.0
16	.....	2.45	2.3	2.3	.....	1.8	1.95	2.0	2.05	2.0
17	.....	2.4	2.3	2.2	2.0	.....	1.9	2.0	2.0	2.0
18	.....	2.35	2.35	2.3	2.0	1.8	1.9	2.0	2.0	2.0
19	.....	2.4	2.8	2.2	2.05	1.8	1.9	2.0	2.0	2.0
20	.....	2.4	2.7	2.3	2.0	1.7	1.9	2.0	2.0	2.0
21	.....	2.4	2.5	2.3	2.0	1.7	1.9	2.0	2.0	2.0
22	.....	2.3	2.45	2.2	2.0	1.8	1.95	2.0	2.0	2.0
23	.....	2.35	2.4	2.2	2.0	1.8	2.0	.....	2.0	2.0
23	.....	2.3	2.35	2.2	2.0	1.8	2.0	2.0	2.0	2.0
25	.....	2.3	2.3	2.3	1.9	1.8	2.0	2.0	2.0	2.0
26	.....	2.3	2.3	2.2	1.9	1.8	2.0	2.0	2.0	2.0
27	.....	2.3	2.3	3.2	1.9	1.8	2.0	2.0	2.05	2.0
28	.....	2.3	2.3	3.05	1.9	1.9	2.0	2.0	2.05	2.0
29	.....	2.3	2.65	2.6	1.9	1.9	2.0	2.0	2.05	2.0
30	.....	2.3	2.5	2.5	1.9	1.9	2.0	2.0	2.0	2.0
31	2.5	.....	2.5	.....	2.0	1.9	.....	2.0	.....	2.0

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Daily discharge, in second-feet, of Muddy Creek near Bynum, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Day.	Apr.	May.	June.	July.
1	24	6	29	28	16	18	5	12	1
2	24	8	23	28	17	12	5	4	1
3	12	8	23	28	18	8	8	11	1
4	12	12	28	28	19	12	92	4	3
5	12	12	32	15	20	12	64	10	1
6	18	5	24	15	21	12	27	10	1
7	18	8	24	6	22	5	20	3	1
8	24	8	24	6	23	8	15	3	1
9	27	8	13	6	23	5	10	3	1
10	18	8	13	1	25	5	7	9	1
11	18	5	13	6	26	5	7	4	1
12	18	5	13	6	27	5	8	320	1
13	18	5	8	6	28	5	8	290	1
14	18	4	8	6	29	5	67	100	1
15	18	4	8	6	30	5	37	70	1
					31		37		1

NOTE.—Discharge determined as follows: Apr. 1 to May 18, from a poorly-defined rating curve; May 19 to June 30, by indirect method for shifting channels; July 1–31, from a poorly-defined rating curve; Aug. 1 to Dec. 31, only monthly means estimated on account of the shifting channel. Discharge interpolated for days for which gage heights are missing.

Monthly discharge of Muddy Creek near Bynum, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	27	5	13.4	797	C.
May	92	4	16.9	1,040	C.
June	320	3	37.9	2,260	D.
July	28	1	6.8	418	D.
August			a.6	37	D.
September			a.3	18	D.
October			a1.0	61	D.
November			a1.0	60	D.
December			a.7	42	D.
The period				4,730	

a Estimated from discharge measurements and gage heights.

BLACKLEAF CREEK NEAR BYNUM, MONT.

Location.—In the NW. ¼ SE. ¼ sec. 22, T. 26 N., R. 6 W., about 200 feet above the mouth of the creek and 2 miles above Bynum.

Records available.—May 24, 1912, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Overhanging chain gage on the left bank.

Control.—Shifts at all stages.

Discharge measurements.—Made by wading near the gage.

Winter flow.—Affected by ice.

Diversions.—All the summer flow is used and flood waters have been filed on by the Teton Cooperative Reservoir Co.

Accuracy.—Frequent discharge measurements are necessary to insure good results.

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Discharge measurements of Blackleaf Creek near Bynum, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 9	C. S. Heidel	2.71	30	July 31	C. S. Heidel	1.80	.62
May 29	B. E. Jones	2.80	50	Aug. 27	B. E. Jones	1.66	.16
June 11	C. S. Heidel	2.12	6.8	Oct. 23	C. S. Heidel	1.90	1.97
24	B. E. Jones	2.04	4.9				

Daily gage height, in feet, of Blackleaf Creek near Bynum, Mont., for 1913.

[A. Baudendistel, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.6	.....	2.35	2.5	1.75	1.7	1.8	1.85	1.85
2	.....	2.7	2.50	2.3	2.45	1.75	1.7	1.8	1.9	1.85
3	.....	3.1	2.6	2.2	2.4	1.7	1.7	1.8	1.95	1.85
4	.....	3.0	2.45	.....	2.4	1.7	1.7	1.8	1.95	1.85
5	.....	2.95	2.35	2.2	2.35	1.75	1.7	.....	1.95	1.85
6	.....	3.0	2.35	2.15	2.25	1.7	1.7	1.9	1.9	1.85
7	.....	3.3	2.35	2.1	2.3	1.75	1.7	2.0	1.9	1.9
8	.....	.....	2.35	2.1	2.25	1.75	1.7	2.05	1.9	1.95
9	.....	2.7	.....	2.15	2.25	1.8	1.7	2.0	1.9	1.95
10	.....	2.7	2.25	2.1	2.2	1.8	1.7	2.0	1.9	1.95
11	.....	.....	2.25	2.1	2.15	1.8	1.7	2.0	1.9	1.95
12	.....	2.75	2.25	2.15	2.15	1.8	1.75	2.5	1.9	1.95
13	.....	2.75	2.25	2.1	.....	1.8	1.75	2.7	1.9	1.95
14	.....	2.65	2.25	2.15	2.05	1.8	1.7	2.4	1.9	1.95
15	.....	2.65	2.2	2.1	2.0	1.8	1.7	2.05	1.9	1.95
16	.....	2.6	2.2	2.15	.....	1.8	1.65	2.0	1.9	1.95
17	.....	2.6	2.2	2.0	2.0	.....	1.7	1.95	1.9	1.95
18	.....	2.45	2.3	1.95	2.0	1.8	1.7	1.95	1.9	1.95
19	.....	2.45	3.05	1.9	1.95	1.8	1.75	1.95	1.9	1.95
20	.....	2.45	2.9	1.85	1.95	1.75	1.75	1.95	1.95	1.95
21	.....	2.45	2.75	1.9	1.85	1.7	1.75	1.95	1.95	1.95
22	.....	2.45	2.7	1.85	1.85	1.75	1.75	1.9	1.95	1.95
23	.....	2.4	2.3	.....	1.85	1.75	1.85	.....	1.95	1.95
24	.....	2.35	2.25	1.95	1.8	1.75	1.85	1.9	1.9	1.95
25	.....	2.3	2.4	2.15	1.8	1.75	1.85	1.9	1.9	1.95
26	.....	2.35	2.35	2.15	1.8	1.7	1.8	1.9	1.9	1.95
27	.....	2.15	2.4	3.15	1.8	1.7	1.8	1.9	1.9	1.95
28	.....	2.15	2.35	2.8	1.8	1.65	1.8	1.85	1.9	1.95
29	.....	2.25	2.95	2.6	1.75	1.65	1.8	1.85	1.9	1.95
30	.....	2.35	2.5	2.65	1.75	1.7	1.8	1.85	1.85	1.95
31	2.6	.....	2.4	.....	1.8	1.7	.....	1.85	.....	1.95

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Daily discharge, in second-feet, of Blackleaf Creek near Bynum, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		23	14	16	25	0.4	0.2	.6	1.3	1.3
2		30	17	14	22	.4	.2	.6	2.0	1.3
3		68	23	9.5	19	.2	.2	.6	3.0	1.3
4		57	14	9.5	19	.2	.2	.6	3.0	1.1
5		52	10	9.5	16	.4	.2	1.3	3.0	1.3
6		57	10	8.0	12	.2	.2	2.0	2.0	1.3
7		91	10	6.5	14	.4	.2	4.0	2.0	2.0
8		60	10	6.5	12	.4	.2	5.2	2.0	1.0
9		30	8	8.0	12	.6	.2	4.0	2.0	1.0
10		30	6.5	6.5	9.5	.6	.2	4.0	2.0	1.0
11		32	6.5	6.5	8.0	.6	.2	4.0	2.0	1.0
12		34	6.5	8.0	8.0	.6	.4	25	2.0	1.0
13		34	6.5	6.5	6.6	.6	.4	40	2.0	1.0
14		26	6.5	8.0	5.2	.6	.2	19	2.0	1.0
15		26	5.0	6.5	4.0	.6	.2	5.2	2.0	1.0
16		23	5.0	8.0	4.0	.6	.1	4.0	2.0	1.0
17		23	5.0	4.0	4.0	.6	.2	3.0	2.0	1.0
18		14	8.0	3.0	4.0	.6	.2	3.0	2.0	1.0
19		14	64	2.0	3.0	.6	.4	3.0	2.0	1.0
20		14	49	1.3	3.0	.4	.4	3.0	3.0	1.0
21		14	37	2.0	1.3	.2	.4	3.0	3.0	1.0
22		14	34	1.3	1.3	.4	.4	2.0	3.0	1.0
23		12	10	2.2	1.3	.4	1.3	2.0	3.0	1.0
24		10	9.2	3.0	.6	.4	1.3	2.0	2.0	1.0
25		8	16	8.0	.6	.4	1.3	2.0	2.0	1.0
26		10	14	8.0	.6	.2	.6	2.0	2.0	1.0
27		4	18	90	.6	.2	.6	2.0	2.0	1.0
28		4	16	50	.6	.1	.6	1.3	2.0	1.0
29		6.5	66	32	.4	.1	.6	1.3	2.0	1.0
30		10	25	36	.4	.2	.6	1.3	1.3	1.0
31	23		19		.6	.2		1.3		1.0

NOTE.—Discharge determined from two rating curves, both fairly well defined above 3 second-feet and applicable to May 18 and after May 28, respectively. Discharge May 19-28 obtained by indirect method or shifting channels. Discharge interpolated for days for which gage heights are missing.

Monthly discharge of Blackleaf Creek near Bynum, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	91	4.0	27.8	1,650	B.
May	66	5.0	17.7	1,090	C.
June	90	1.3	12.7	756	B.
July	25	.4	7.05	433	B.
August	.6	.1	.40	24.6	C.
September	1.3	.1	.41	24.4	C.
October	40	.6	4.91	302	B.
November	3.0	1.3	2.19	130	C.
December	3.0	1.3	2.64	162	C.
The period				4,570	

MUSSELSHELL RIVER BASIN.

NORTH FORK OF MUSSELSHELL RIVER NEAR MARTINSDALE, MONT.

Location.—In sec. 6, T. 8 N., R. 12 E., half a mile above the junction of the North and South Forks, at the ranch of Martin J. Settle, 4 miles north of Martinsdale.

Drainage area.—Not measured.

Records available.—May 10, 1907, to December 31, 1913.

Gage.—Chain on left bank just above observer's private wagon bridge.

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Control.—Composed of gravel; may shift somewhat during high water, as current is swift.

Discharge measurements.—Made from the private wagon bridge or by wading.

Winter flow.—Affected by ice.

Storage.—Under a Carey Act project the flood waters of the North Fork, the normal flow of which is practically all appropriated, will be stored at a point about 20 miles above the station and used to irrigate land between Martinsdale and Harlowton.

Accuracy.—Records obtained during open season very good.

Discharge measurements of North Fork of Musselshell River near Martinsdale, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 16	C. S. Heidel	4.60	200	Aug. 29	C. S. Heidel	3.23	12
May 20	do	4.34	159	Nov. 7	do	3.52	35
July 12	do	3.70	58				

Daily gage height, in feet, of North Fork of Musselshell River near Martinsdale, Mont., for 1913.

[Arthur H. Settle, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	4.1	4.5	4.1	3.4	3.3	3.4	3.5
2	.....	4.1	4.5	4.2	3.4	3.3	3.4	3.5
3	.....	4.0	4.4	4.1	3.4	3.3	3.4	3.5
4	.....	4.0	4.3	4.2	3.4	3.3	3.5	3.5
5	.....	3.9	4.3	4.0	3.4	3.2	3.5	3.5
6	.....	3.9	4.2	4.0	3.4	3.2	3.5	3.5
7	.....	3.9	4.1	4.0	3.3	3.2	3.5	3.5
8	.....	4.0	4.0	3.9	3.3	3.2	3.5	3.5
9	.....	4.1	4.0	3.9	3.4	3.3	3.5	3.5
10	.....	4.2	3.9	3.8	3.5	3.3	3.5	3.5
11	.....	4.5	3.9	3.65	3.4	3.3	3.6	3.5
12	.....	4.5	4.5	3.7	3.4	3.3	3.7	3.5
13	.....	4.4	4.5	3.7	3.3	3.3	3.6	3.4
14	.....	4.5	4.5	3.6	3.0	3.3	3.5	3.6
15	.....	4.3	4.5	3.6	3.0	3.3	3.5	3.7
16	.....	4.3	4.5	3.65	3.0	3.3	3.5	3.5
17	4.9	4.2	4.5	3.65	3.0	3.2	3.5	3.5
18	4.8	4.3	4.5	3.5	3.0	3.3	3.5	3.4
19	5.5	4.5	4.5	3.5	3.0	3.3	3.5	3.4
20	5.6	4.4	4.8	3.5	3.0	3.3	3.5	3.4
21	4.9	4.3	4.5	3.5	3.0	3.3	3.5	3.5
22	4.9	4.3	4.5	3.5	3.3	3.4	3.5	3.5
23	4.5	4.4	4.5	3.5	3.3	3.4	3.5	.....
24	4.3	4.5	4.5	3.5	3.2	3.3	3.5	.....
25	4.2	4.6	4.5	3.4	3.2	3.3	3.5	.....
26	4.1	4.6	4.3	3.4	3.2	3.4	3.5	.....
27	4.2	4.6	4.4	3.3	3.2	3.3	3.5	.....
28	4.4	4.7	4.6	3.3	3.2	3.3	3.5	.....
29	4.3	4.6	4.1	3.3	3.2	3.4	3.5	.....
30	4.2	4.8	4.1	3.5	3.2	3.4	3.5	.....
31	.....	4.7	.....	3.5	3.2	.....	3.5	.....

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Daily discharge, in second-feet, of North Fork of Musselshell River near Martinsdale, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	117	187	117	25	17	25	34
2	.....	117	187	134	25	17	25	34
3	.....	100	169	117	25	17	25	34
4	.....	100	151	134	25	17	34	34
5	.....	84	151	100	25	10	34	34
6	.....	84	134	100	25	10	34	34
7	.....	84	117	100	17	10	34	34
8	.....	100	100	84	17	10	34	34
9	.....	117	100	84	25	17	34	34
10	.....	134	84	70	34	17	34	34
11	.....	187	84	51	25	17	45	34
12	668	187	187	57	25	17	57	34
13	668	169	187	57	17	17	45	25
14	565	187	187	45	2	17	34	45
15	400	151	187	45	2	17	34	57
16	200	151	187	51	2	17	34	34
17	262	134	187	51	2	10	34	34
18	243	151	187	34	2	17	34	25
19	384	187	187	34	2	17	34	25
20	405	169	243	34	2	17	34	25
21	262	151	187	34	2	17	34	34
22	262	151	187	34	17	25	34	34
23	187	169	187	34	17	25	34	.....
24	151	187	187	34	10	17	34	.....
25	134	205	187	25	10	17	34	.....
26	117	205	151	25	10	25	34	.....
27	134	205	169	17	10	17	34	.....
28	169	224	205	17	10	17	34	.....
29	151	205	117	17	10	25	34	.....
30	134	243	117	34	10	25	34	.....
31	.....	224	.....	34	10	.....	34	.....

NOTE.—Discharge determined from a fairly well-defined rating curve. Discharge Apr. 12–16 estimated from observer's notes and high-water marks. Nov. 23–30, discharge estimated at 25 second-feet.

Monthly discharge of North Fork of Musselshell River near Martinsdale, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 12–30	.....	.....	289	10,900	C.
May	243	84	157	9,650	B.
June	243	84	163	9,700	B.
July	134	17	58.2	3,580	B.
August	34	2	14.2	873	B.
September	25	10	17.2	1,020	B.
October	57	25	34.6	2,130	B.
November	57	.....	31.5	1,870	C.
The period	.....	.....	.....	39,700	

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MUSSELSHELL RIVER AT HARLOWTON, MONT.

Location.—In sec. 26, T. 8 N., R. 15 E., at the highwaybridge 1 mile south of Harlowton.

Records available.—July 11, 1907, to December 31, 1913. A station was maintained at Shawmut from August 12, 1902, to June 30, 1907.

Drainage area.—Not measured.

Gages.—Standard chain gage on the upstream side of the public highway bridge installed May 24, 1909, at a datum 0.52 foot higher than that previously used. All gage heights for 1909 were corrected to the new datum.

Control.—Bed of stream composed of sand and gravel; will probably shift in flood.

Discharge measurements.—Made from bridge or by wading.

Diversions.—A large part of the valley is irrigated and many small ditches take water from the Musselshell; practically the entire flow of the stream is appropriated. A minimum discharge of 2 second-feet has been recorded during the irrigation season at this station.

Discharge measurements of Musselshell River at Harlowton, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 18	C. S. Heidel	2.19	693	Aug. 28	C. S. Heidel	0.40	31
May 19	do	2.08	631	Nov. 7	do	.84	106
July 11	do	1.30	238				

Daily gage height, in feet, of Musselshell River at Harlowton, Mont., for 1913.

[W. G. Yamamoto, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	0.71	1.7	2.8	1.8	0.70	0.39	0.58	0.85
2	.74	1.65	2.7	1.8	.64	.36	.60	.85
3	.81	1.6	2.6	1.8	.62	.35	.65	.85
4	.85	1.6	2.5	1.8	.62	.31	.65	.85
5	.85	1.45	2.45	1.8	.62	.29	.68	.84
6	.94	1.4	2.3	1.75	.62	.26	.68	.82
7	1.20	1.4	2.2	1.6	.62	.25	.68	.82
8	1.3	1.45	2.2	1.5	.62	.22	.72	.82
9	1.5	1.6	2.1	1.4	.62	.22	.79	.82
10	1.8	1.8	2.0	1.35	.62	.25	.85	.82
11	2.1	2.1	2.0	1.3	.60	.26	.85	.84
12	2.3	2.2	2.5	1.25	.60	.31	.88	.85
13	2.45	2.2	2.4	1.2	.59	.35	.89	.85
14	2.5	2.1	2.1	1.15	.56	.38	.94	.85
15	2.5	2.0	2.1	1.1	.55	.36	.96	.85
16	2.1	1.95	2.05	1.1	.52	.35	1.00	.85
17	2.0	1.9	2.05	1.05	.52	.35	.96	.84
18	2.1	1.9	2.05	1.0	.52	.35	.94	.82
19	2.1	2.0	2.05	1.0	.52	.35	.94	.81
20	2.1	1.95	2.05	.98	.55	.35	.88	.80
21	2.0	1.95	2.05	.91	.54	.36	.89	.78
22	2.0	1.9	2.0	.85	.52	.39	.91	.78
23	1.9	1.95	1.9	.8	.52	.42	.92	.79
24	1.8	2.0	1.8	.76	.52	.46	.90	.86
25	1.6	2.2	1.7	.74	.52	.49	.90	.90
26	1.5	2.35	1.85	.70	.48	.51	.90	.96
27	1.4	2.5	1.95	.70	.46	.52	.88	1.00
28	1.5	2.7	1.95	.72	.42	.55	.88	1.05
29	1.8	2.8	1.9	.75	.39	.55	.86	1.1
30	1.8	2.8	1.9	.76	.35	.56	.85	1.05
31	.....	2.8	.....	.70	.36	.....	.....	.....

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Daily discharge, in second-feet, of Musselshell River at Harlowton, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	79	406	1,200	456	77	31	56	106
2	85	383	1,110	456	66	28	59	106
3	99	360	1,020	456	63	28	68	106
4	106	360	932	456	63	24	68	106
5	106	297	891	456	63	22	73	106
6	130	277	772	431	63	20	73	102
7	206	277	699	360	63	20	73	102
8	240	297	699	317	63	17	81	102
9	317	360	631	277	63	17	95	102
10	456	456	568	258	63	20	106	102
11	631	631	568	240	59	20	106	106
12	772	699	932	223	59	24	115	106
13	891	699	850	206	58	28	118	106
14	932	631	631	190	53	30	130	106
15	932	568	631	175	52	28	136	106
16	631	539	600	175	47	28	146	106
17	568	510	600	160	47	28	136	106
18	631	510	600	146	47	28	130	102
19	631	568	600	146	47	28	130	99
20	631	539	600	141	52	28	115	97
21	568	539	600	123	50	28	118	93
22	568	510	568	108	47	31	122	93
23	510	539	510	97	47	34	126	95
24	456	568	456	89	47	39	120	111
25	360	699	406	85	47	43	120	.....
26	317	811	483	77	42	46	120	.....
27	277	932	539	77	39	47	115	.....
28	317	1,110	539	81	34	52	115	.....
29	456	1,200	510	87	31	52	111	.....
30	456	1,200	510	89	28	53	108	.....
31	.....	1,200	.....	77	28	.....	108	.....

NOTE.—Discharge determined from a fairly well-defined rating curve. Discharge Nov. 25–30 estimated at 100 second-feet.

Monthly discharge of Musselshell River at Harlowton, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	932	79	445	26,500	B.
May	1,200	277	602	37,000	B.
June	1,200	406	675	40,200	B.
July	456	77	217	13,300	B.
August	77	28	51.9	3,190	B.
September	53	17	30.7	1,830	B.
October	146	56	106	6,520	B.
November	111	.....	103	6,130	B.
The period	.....	.....	.....	135,000	

CHECKERBOARD CREEK NEAR DELPINE, MONT.

Location.—In the SW. ¼ SW. ¼ sec. 4, T. 9 N., R. 9 E., 2½ miles above the junction of Checkerboard Creek with Musselshell River, 8 miles from Delpine post office, and 21 miles from Martinsdale, Mont.

Records available.—May 26, 1909, to December 31, 1911; May 21 to December 31, 1913.

Drainage area.—Not measured.

Gage.—A vertical staff set April 9, 1911, about 40 feet downstream from the original staff gage, at a better section and at a different datum.

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Control.—Gravel.

Discharge measurements.—Made from foot log or by wading.

Winter flow.—Affected by ice.

Diversions.—It is proposed to divert the water from this creek over a small divide into the reservoir on the North Fork of Musselshell River. The creek is about 12 miles long and has no tributaries.

Discharge measurements of Checkerboard Creek near Delpine, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 17	C. S. Heidel	2.94	33	Aug. 30	C. S. Heidel	2.20	5.4
May 21	do	2.80	25.9	Nov. 8	do	2.17	3.6
July 13	do	2.35	10.2				

Daily gage height, in feet, and discharge, in second-feet, of Checkerboard Creek near Delpine, Mont., for 1913.

[J. A. Porter, observer.]

Day.	April.		May.		June.		July.		August.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1					3.05	39	2.45	12		7.5
2					3.05	39	2.45	12		7.5
3					3.0	36		12		7.5
3					3.0	36		11		7.5
5					2.95	34		11		7.5
6					2.85	28	2.4	11		7.5
7					2.8	26	2.35	9.5		7.5
8					2.8	26	2.35	9.5		7.5
9					2.75	24	2.35	9.5		7.5
10					2.7	22	2.3	8.0	2.28	7.6
11					2.7	22	2.3	8.0	2.28	7.6
12					2.9	31	2.35	9.5	2.25	7.0
13	4.1	110			2.65	20	2.35	9.5	2.25	7.0
14					2.65	20	2.35	9.5	2.25	7.0
15						19	2.35	9.5	2.25	7.0
16					2.6	18	2.32	8.6	2.25	7.0
17					2.8	26	2.32	8.6	2.25	7.0
18					2.75	24	2.32	8.6	2.25	7.0
19					2.5	14	2.30	8.0	2.25	7.0
20					2.5	14	2.30	8.0	2.25	7.0
21			2.8	26	2.45	12	2.30	8.0	2.25	7.0
22			2.95	34	2.5	14	2.30	8.0	2.25	7.0
23			2.9	31	2.5	14	2.30	8.0	2.25	7.0
24			2.9	31	2.45	12	2.30	8.0	2.25	7.0
25			3.0	36	2.6	18	2.30	8.0	2.12	4.4
26			3.1	42	2.5	14	2.22	6.4	2.12	4.4
27			3.3	53	2.5	14		7.0	2.20	6.0
28			3.5	65	2.45	12		7.0	2.20	6.0
29			3.55	68		12		7.0	2.20	6.0
30			3.5	65		12		7.0		6.0
31			3.0	36				7.0		6.0

NOTE.—Gage height Apr. 13 estimated from flood marks.
Discharge determined from a fairly well defined rating curve. Discharge estimated July 27 to Aug. 9, and interpolated for other days for which gage heights are missing.

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Monthly discharge of Checkerboard Creek near Delpine, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 21–31	68	26	44.3	967	B.
June	39	12	21.7	1,290	B.
July	12	6.4	8.86	545	C.
August	7.6	4.4	6.85	421	C.

SOUTH FORK OF MUSSELSHELL RIVER NEAR MARTINSDALE, MONT.

Location.—In the S. ½ sec. 12, T. 8 N., R. 11 E., near the public highway, 1½ miles northeast of Martinsdale, near the blacksmith's shop of the Martinsdale Sheep Co., at a point about 1½ miles above the original site, which was near the ranch of M. J. Settle.

Records available.—June 19, 1907, to April 28, 1908 (old station); April 28, 1908, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff nailed to tree on the right bank. The datum of this gage bears no determined relation to the datum of the gage at the original station.

Control.—Bed of stream is chiefly gravel, is clean, and nonshifting.

Discharge measurements.—Made by wading near the gage or from a bridge 150 feet below.

Winter flow.—Affected by ice.

Diversions.—Many small ditches take water from the creek and during the irrigating season all the water is diverted.

Accuracy.—Open season records good.

Discharge measurements of South Fork of Musselshell River near Martinsdale, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 18	C. S. Heidel	4.22	382	Aug. 29	C. S. Heidel	1.02	3.6
May 20	do	3.52	245	Nov. 7	do	1.69	27
July 12	do	2.30	77				

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Daily gage height, in feet, of South Fork of Musselshell River near Martinsdale, Mont., for 1913.

[Fred Gerdts, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1		3.35	5.2	2.9	1.45	1.05	1.2	1.85
2		3.2	5.0	2.95	1.2	1.05	1.1	1.9
3		3.0	4.9	2.8	1.15	1.05	1.1	1.8
4		2.9	4.7	3.05	1.15	1.1	1.1	1.75
5		2.8	4.6	2.85	1.15	1.1	1.3	1.7
6		2.8	4.4	2.75	1.25	1.05	1.5	1.9
7		3.05	4.2	2.65	1.25	1.05	1.6	1.7
8		3.5	4.0	2.55	1.2	1.25	1.6	1.7
9		3.6	3.9	2.4	1.2	1.25	1.65	1.8
10		3.7	3.8	2.4	1.4	1.25	1.65	1.8
11		4.6	3.6	2.3	1.5	1.3	1.75	1.8
12		4.5	4.6	2.35	1.45	1.3	2.1	1.75
13		4.4	4.0	2.2	1.4	1.25	2.2	1.7
14		4.0	3.8	2.2	1.4	1.2	2.2	1.7
15		3.9	3.8	2.1	1.4	1.2	2.1	1.7
16	3.6	3.8	3.8	2.0	1.4	1.15	2.0	1.75
17	3.6	3.7	3.7	1.9	1.5	1.15	2.0	1.75
18	4.0	3.7	3.6	1.95	1.5	1.1	1.85	1.8
19	4.2	3.7	4.1	1.7	1.5	1.1	1.8	1.9
20	4.3	3.6	3.7	1.65	1.5	1.15	1.8	1.9
21	3.8	3.4	3.45	1.6	1.55	1.15	1.85	.....
22	4.4	3.4	3.35	1.45	1.5	1.05	1.8	.....
23	3.35	3.8	3.1	1.45	1.45	1.1	1.8	.....
24	3.1	4.1	3.15	1.45	1.45	1.1	1.8	.....
25	3.0	4.8	3.25	1.45	1.4	1.15	1.85	.....
26	2.9	5.2	3.25	1.4	1.1	1.15	1.8	.....
27	3.5	5.4	3.35	1.45	1.05	1.15	1.85	.....
28	3.8	5.6	3.2	1.35	1.05	1.15	1.9	.....
29	3.7	5.6	3.05	1.3	1.05	1.2	1.9	.....
30	3.45	5.4	2.95	1.7	1.05	1.3	1.9	.....
31	.....	5.2	.....	1.55	1.0	.....	1.85	.....

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Daily discharge, in second-feet, of South Fork of Musselshell River near Martinsdale, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	218	789	148	17	4.4	8.0	40
2	.....	193	693	155	8	4.4	5.5	43
3	.....	162	647	134	6.8	4.4	5.5	36
4	.....	148	561	170	6.8	5.5	5.5	33
5	.....	134	522	141	6.8	5.5	11	30
6	.....	134	453	128	9.5	4.4	19	43
7	.....	170	395	115	9.5	4.4	24	30
8	.....	243	345	104	8	9.5	24	30
9	.....	261	322	87	8	9.5	27	36
10	.....	280	300	87	15	9.5	27	76
11	.....	522	201	77	19	11	33	36
12	.....	486	522	82	17	11	58	33
13	.....	453	345	67	15	9.5	67	30
14	.....	345	300	67	15	8	67	30
15	.....	322	300	58	15	8	58	30
16	261	300	300	50	15	6.8	50	33
17	261	280	280	43	19	6.8	50	33
18	345	280	261	46	19	5.5	40	.....
19	395	280	369	30	19	5.5	36	.....
20	423	261	280	27	19	6.8	36	.....
21	300	226	234	24	22	6.8	40	.....
22	453	226	218	17	19	4.4	36	.....
23	218	300	177	17	17	5.5	36	.....
24	177	369	185	17	17	5.5	36	.....
25	162	603	201	17	15	6.8	40	.....
26	148	789	201	15	5.5	6.8	36	.....
27	243	891	218	17	4.4	6.8	40	.....
28	300	1,000	193	13	4.4	6.8	43	.....
29	280	1,000	170	11	4.4	8	43	.....
30	234	891	155	30	4.4	11	43	.....
31	.....	789	.....	22	3.2	.....	40	.....

NOTE.—Discharge determined from a fairly well defined rating curve. Discharge Nov. 18–30 estimated at 25 second-feet.

Monthly discharge of South Fork of Musselshell River near Martinsdale, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 16–30	453	148	280	8,330	B.
May	1,000	134	405	24,900	B.
June	789	155	340	20,200	B.
July	170	11	65.0	4,000	B.
August	22	3.2	12.4	762	B.
September	11	4.4	6.96	414	B.
October	67	5.5	35.0	2,150	B.
November	43	.....	30.2	1,800	C.
The period	.....	.....	.....	62,600	

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AMERICAN FORK NEAR HARLOWTON, MONT.

Location.—At the Shaw & Elliott ranch, 5 miles southeast of Harlowton, Mont., a few miles above the junction of the American Fork with the Musselshell.

Records available.—July 28, 1907, to December 31, 1911, and May 19, 1913, to December 31, 1913.

Gage.—Chain fastened to upper rail of small wagon bridge.

Channel.—Bed composed of sand and clay; shifts only at extremely high stages.

Discharge measurements.—Made from the bridge or by wading.

Winter flow.—Affected by ice.

Storage.—The basin of the American Fork affords some good storage sites and by holding back the spring flood waters, which are derived from the melting snow on the mountains, much more land can be put under irrigation.

Accuracy.—Open-season records good.

Discharge measurements of American Fork near Harlowton, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 18	C. S. Heidel	1.24	3.26	Aug. 29	C. S. Heidel	[a] 0.75	0
May 19	do	1.92	41	Nov. 7	do	1.16	2.51
July 12	do	1.42	11.4				

[a] Gage height of zero flow is probably about 0.95.

Daily gage height, in feet, of American Fork near Harlowton, Mont., for 1913.

[G. M. Glennie, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	2.8	2.3	1.15	0.9	1.15	1.2
2	.....	2.8	2.2	1.1	1.1	1.15	1.2
3	.....	2.7	2.15	1.1	1.1	1.05	1.2
4	.....	2.7	2.2	1.1	1.0	1.0	1.2
5	.....	2.45	2.05	1.25	.95	1.05	1.1
6	.....	2.7	2.0	1.1	.9	1.15	1.15
7	.....	2.7	2.15	1.1	.8	1.25	1.15
8	.....	2.7	2.15	1.05	.8	1.25	1.15
9	.....	2.1	2.0	1.15	.8	1.3	1.15
10	.....	1.95	1.5	1.2	.85	1.3	1.2
11	.....	2.0	1.4	1.1	.95	1.2	1.2
12	.....	3.2	1.4	1.1	.95	1.15	1.2
13	.....	3.1	1.35	1.1	.9	1.35	1.15
14	.....	3.2	1.4	1.05	1.05	1.35	1.2
15	.....	3.05	1.25	1.1	1.0	1.25	1.2
16	.....	3.0	1.25	1.1	1.05	1.2	1.15
17	.....	3.1	1.3	1.1	.95	1.25	1.15
18	.....	2.5	1.25	1.1	.9	1.2	1.2
19	1.9	2.35	1.25	1.15	.9	1.2	1.2
20	1.85	2.25	1.2	1.1	.8	1.25	1.25
21	1.8	2.3	1.1	1.05	.9	1.2	1.2
22	1.65	2.2	1.2	1.1	1.05	1.2	1.2
23	1.65	2.1	1.0	1.05	1.2	1.15	.....
24	1.7	2.15	1.2	1.1	1.05	1.2	.....
25	3.1	2.15	1.1	.9	.9	1.25	.....
26	3.1	2.6	1.15	.8	1.15	1.2	.....
27	3.2	2.65	1.15	.75	1.05	1.2	.....
28	3.4	2.5	1.15	.75	1.15	1.2	.....
29	3.0	2.5	1.2	.7	1.1	1.2	.....
30	3.0	2.35	1.3	.6	1.05	1.25	.....
31	3.0	.....	1.2	.85	.....	1.2	.....

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Daily discharge, in second-feet, of American Fork near Harlowton, Mont., for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	197	93	2.2	0.0	2.2	3.0
2	.....	197	77	1.3	1.3	2.2	3.0
3	.....	173	70	1.3	1.3	.8	3.0
4	.....	173	77	1.3	.3	.3	3.0
5	.....	121	57	4.1	.0	.8	1.3
6	.....	173	51	1.3	.0	2.2	2.2
7	.....	173	70	1.3	.0	4.1	2.2
8	.....	173	70	.8	.0	4.1	2.2
9	.....	63	51	2.2	.0	5.2	2.2
10	.....	46	13	3.0	.0	5.2	3.0
11	.....	51	8.7	1.3	.0	3.0	3.0
12	.....	313	8.7	1.3	.0	2.2	3.0
13	.....	281	7.0	1.3	.0	7.0	2.2
14	.....	313	8.7	.8	.8	7.0	3.0
15	.....	266	4.1	1.3	.3	4.1	3.0
16	.....	251	4.1	1.3	.8	3.0	2.2
17	.....	281	5.2	1.3	.0	4.1	2.2
18	.....	131	4.1	1.3	.0	3.0	3.0
19	41	102	4.1	2.2	.0	3.0	3.0
20	37	85	3.0	1.3	.0	4.1	4.1
21	32	93	1.3	.8	.0	3.0	3.0
22	22	77	3.0	1.3	.8	3.0	3.0
23	22	63	.3	.8	3.0	2.2	.....
24	25	70	3.0	1.3	.8	3.0	.....
25	281	70	1.3	.0	.0	4.1	.....
26	281	151	2.2	.0	2.2	3.0	.....
27	313	162	2.2	.0	.8	3.0	.....
28	386	131	2.2	.0	2.2	3.0	.....
29	251	131	3.0	.0	1.3	3.0	.....
30	251	102	5.2	.0	.8	4.1	.....
31	251	.....	3.0	.0	.....	3.0	.....

NOTE.—Discharge determined from a rating curve fairly well-defined above 1.3 second-feet.

Monthly discharge of American Fork near Harlowton, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 19-31	386	22	169	4,360	B.
June	313	46	154	9,160	B.
July	93	0.3	23.0	1,410	B.
August	4.1	0	1.17	72	C.
September	3.0	0	.56	33	C.
October	7.0	.3	3.29	202	C.
November 1-22	4.1	1.3	2.72	119	B.
The period	.....	.....	.....	15,400	

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LEBO CREEK NEAR HARLOWTON, MONT.

Location.—Near the Shaw & Elliott ranch, 5 miles southeast of Harlowton, half a mile above the junction of the creek with American Fork.

Records available.—July 28, 1907, to December 31, 1911, and May 19, 1913, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff on the right bank, nailed to the pile of the small wagon bridge; its datum is the same as that of the gage on the American Fork.

Control.—Channel contains growth of grass.

Discharge measurements.—Made by wading.

Winter flow.—Affected by ice.

Diversions.—The water of the stream is used for irrigation.

Accuracy.—Records only fair as gage heights are affected by backwater caused by grass in the stream bed.

Lebo Creek is about 20 miles long, is fed by springs, and its flow is nearly uniform.

Discharge measurements of Lebo Creek near Harlowton, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 18	C. S. Heidel	1.47	32	Aug. 29	C. S. Heidel	1.05	13.1
May 19	do	1.45	30	Nov. 7	do	1.22	19.6
July 12	do	1.18	14.1				

Daily gage height, in feet, of Lebo Creek near Harlowton, Mont., for 1913.

[G. M. Glennie, Observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	1.1	1.15	0.9	1.15	1.15	1.25
2	.....	1.1	1.3	.85	1.05	1.15	1.3
3	.....	1.1	1.2	.85	1.0	1.15	1.3
4	.....	1.1	1.2	.85	1.05	1.1	1.25
5	.....	1.4	1.2	.9	1.05	1.1	1.15
6	.....	1.55	1.2	.9	1.05	1.2	1.3
7	.....	1.65	1.1	.85	1.1	1.2	1.3
8	.....	1.65	1.15	.85	1.05	1.2	1.25
9	.....	1.4	1.2	.85	1.05	1.3	1.25
10	.....	1.1	1.15	.85	1.05	1.3	1.25
11	.....	1.0	1.1	.85	1.15	1.2	1.25
12	.....	2.4	1.1	.85	1.1	1.5	1.25
13	.....	2.2	1.1	.95	1.15	1.3	1.25
14	.....	2.4	1.1	1.1	1.1	1.2	1.25
15	.....	1.8	1.1	1.0	1.05	1.2	1.3
16	.....	1.5	1.05	1.1	1.1	1.2	1.25
17	.....	1.55	1.1	1.0	1.15	1.2	1.3
18	.....	1.5	1.0	1.1	1.0	1.2	1.3
19	1.45	1.45	1.0	1.1	1.05	1.2	1.25
20	1.6	1.4	1.0	1.05	1.0	1.2	1.25
21	1.3	1.4	1.0	1.0	1.05	1.2	1.3
22	1.25	1.2	1.0	1.05	1.1	1.2	1.3
23	1.1	1.25	.9	1.05	1.2	1.2	.....
24	1.1	1.35	.8	1.05	1.15	1.2	.....
25	1.05	1.35	.85	1.1	1.1	1.3	.....
26	1.0	1.55	.8	1.05	1.1	1.3	.....
27	1.1	1.7	.8	1.0	1.05	1.3	.....
28	1.05	1.4	.85	1.05	1.1	1.25	.....
29	1.1	1.4	.9	1.05	1.1	1.25	.....
30	1.1	1.5	.9	1.1	1.15	1.3	.....
31	1.0	.....	.9	1.1	.....	1.3	.....

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Daily discharge, in second-feet, of Lebo Creek near Harlowton, Mont., for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	17	12	7.0	16	16	20
2	.....	17	18	6.2	14	16	22
3	.....	17	14	6.2	12	16	22
4	.....	17	14	6.4	14	15	20
5	.....	29	14	7.4	14	15	16
6	.....	35	14	7.6	14	18	22
7	.....	40	11	6.6	15	18	22
8	.....	40	12	6.8	14	18	20
9	.....	29	14	6.8	14	22	20
10	.....	17	12	7.0	14	22	20
11	.....	14	11	7.0	16	18	20
12	.....	81	11	7.0	15	30	20
13	.....	69	11	9.5	16	22	20
14	.....	80	11	15	15	18	20
15	.....	45	11	12	14	18	22
16	.....	31	9.5	15	15	18	20
17	.....	33	11	12	16	18	22
18	.....	30	8.0	15	12	18	22
19	31	28	8.0	15	14	18	20
20	37	25	8.0	14	12	18	20
21	25	25	8.0	12	14	18	22
22	23	17	8.0	14	15	18	22
23	17	18	6.2	14	18	18	.....
24	17	22	4.2	14	16	18	.....
25	16	21	5.4	15	15	22	.....
26	14	29	4.4	14	15	22	.....
27	17	35	4.6	12	14	22	.....
28	16	22	5.6	14	15	20	.....
29	17	22	6.8	14	15	20	.....
30	17	25	6.8	15	16	22	.....
31	14	.....	7.0	15	.....	22	.....

NOTE.—Discharge determined as follows: May 19 to June 11, from a poorly-defined rating curve; June 12–30, by indirect method for shifting channels; July 1–22, from a poorly-defined rating curve; July 23 to Aug. 13, by indirect method for shifting channels; Aug. 14 to Nov. 22, from a fairly well-defined rating curve.

Monthly discharge of Lebo Creek near Harlowton, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 19–31	37	14	20.1	518	C.
June	81	14	31.0	1,840	C.
July	18	4.2	9.73	598	C.
August	15	6.2	11.0	676	C.
September	18	12	14.6	869	B.
October	30	15	19.2	1,180	B.
November 1–22	22	16	20.6	899	B.
The period	.....	.....	.....	6,580	

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FLATWILLOW CREEK NEAR FLATWILLOW, MONT.

Location.—In sec. 23, T. 12 N., R. 25 E., at Flatwillow Ranch Co.'s ranch, 8 miles above Flatwillow and 30 miles north of Roundup.

Records available.—May 3, 1911, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff gage, marked to tenths of feet, nailed to a timber driven into bed of stream and braced to the banks; below the wagon bridge near the ranch buildings.

Channel.—Likely to shift; current very sluggish.

Discharge measurements.—At high stages made from a footbridge behind house; at low water made by wading below house.

Winter flow.—Affected by ice.

Diversions.—Much water is diverted above the gage during the irrigating season. A canal to divert water into the storage reservoir of the Flatwillow Carey project heads about a mile above the station.

Discharge measurements of Flatwillow Creek near Flatwillow, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 19	C. S. Heidel	5.5	161	Aug. 27	C. S. Heidel	2.45	20
May 17	do	4.9	132	Nov. 6	do	2.92	37
July 10	do	4.1	93				

Daily gage height, in feet, of Flatwillow Creek near Flatwillow, Mont., for 1913.

[J. D. Brinegar, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	5.4	5.9	5.2	3.0	2.6	2.5	3.1	2.8
2	.....	5.4	5.7	5.1	2.9	2.6	2.5	3.1	2.9
3	.....	5.4	5.6	4.8	2.9	2.5	2.5	3.0	3.0
4	.....	5.4	5.4	4.7	2.8	2.5	2.6	3.0	2.9
5	.....	5.4	5.3	4.4	2.7	2.5	2.7	2.9	2.9
6	4.4	5.2	5.0	4.5	2.6	2.5	2.8	2.9	2.9
7	4.5	5.0	5.1	4.2	2.6	2.5	2.7	2.9	2.9
8	4.6	4.8	4.9	4.1	2.6	2.4	2.7	2.9	3.0
9	4.6	4.7	4.9	4.0	2.7	2.4	2.8	2.9	2.8
10	4.8	4.7	4.8	4.1	2.8	2.4	2.8	2.9	3.0
11	4.9	4.8	4.9	4.1	2.8	2.4	2.7	2.9	3.0
12	4.9	4.9	6.5	4.1	2.7	2.4	2.7	2.9	3.0
13	4.9	5.0	7.6	4.0	2.6	2.4	2.8	2.8	3.0
14	5.2	5.5	5.3	3.8	2.6	2.4	2.8	2.8	2.9
15	5.3	5.5	5.4	3.7	2.6	2.4	2.8	2.8	2.9
16	5.3	4.9	5.2	3.6	2.6	2.4	2.7	2.9	2.9
17	5.4	4.9	5.3	3.4	2.6	2.4	2.7	2.9	2.9
18	5.5	5.6	5.1	3.5	2.6	2.4	2.7	2.9	2.9
19	5.6	5.9	5.1	3.7	2.6	2.4	2.8	2.9	2.9
20	5.8	5.9	4.9	3.7	2.6	2.4	2.8	3.0	2.9
21	6.0	6.0	4.9	4.0	2.6	2.5	2.8	3.0	3.0
22	6.0	5.9	4.7	4.2	2.6	2.6	2.8	3.0	3.0
23	5.9	5.8	4.7	4.0	2.5	2.7	2.8	2.9	3.0
24	6.0	5.7	4.6	3.8	2.5	2.7	2.8	2.8	3.0
25	6.0	5.7	4.6	3.4	2.5	2.7	2.8	2.9	3.0
26	5.9	5.8	4.5	3.2	2.5	2.7	2.9	3.0	3.0
27	5.7	5.8	4.5	3.1	2.5	2.7	2.9	3.0	3.0
28	5.5	6.0	4.4	3.1	2.5	2.7	3.0	2.9	3.0
29	5.5	6.9	5.1	3.1	2.5	2.6	3.0	3.0	3.1
30	5.5	6.4	5.4	3.1	2.5	2.6	3.0	2.9	3.2
31	.....	6.0	.....	3.0	2.6	.....	3.1	.....	3.2

NOTE.—Dec. 21 to 31, gage heights affected by ice.

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Daily discharge, in second-feet, of Flatwillow Creek near Flatwillow, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	161	191	149	40	25	22	44	32
2	.....	161	179	143	36	25	22	44	36
3	.....	161	173	125	36	22	22	40	40
4	.....	161	161	119	32	22	25	40	36
5	.....	161	155	104	28	22	28	36	36
6	104	149	137	109	25	22	32	36	36
7	109	137	143	94	25	22	28	36	36
8	114	125	131	89	25	19	28	36	40
9	114	119	131	84	28	19	32	36	32
10	125	119	125	89	32	19	32	36	40
11	131	125	131	89	32	19	28	36	40
12	131	131	230	89	28	19	28	36	40
13	131	137	307	84	25	19	32	32	40
14	149	167	155	74	25	19	32	32	36
15	155	167	161	69	25	19	32	32	36
16	155	131	149	64	25	19	28	36	36
17	161	131	155	56	25	19	28	36	36
18	167	173	143	60	25	19	28	36	36
19	173	191	143	69	25	19	32	36	36
20	185	191	131	69	25	19	32	40	36
21	197	197	131	84	25	22	32	40	.....
22	197	191	119	94	25	25	32	40	.....
23	191	185	119	84	22	28	32	36	.....
24	197	179	114	74	22	28	32	32	.....
25	197	179	114	56	22	28	32	36	.....
26	191	185	109	48	22	28	36	40	.....
27	179	185	109	44	22	28	36	40	.....
28	167	197	104	44	22	28	40	36	.....
29	167	258	143	44	22	25	40	40	.....
30	167	223	161	44	22	25	40	36	.....
31	.....	197	.....	40	25	.....	44	.....	.....

NOTE.—Discharge determined from a fairly well-defined rating curve. Dec. 21 to 31, discharge estimated at 36 second-feet.

Monthly discharge of Flatwillow Creek near Flatwillow, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 6–30	197	104	158	7,840	B.
May	258	119	167	10,300	B.
June	307	104	148	8,810	B.
July	149	40	80.1	4,930	B.
August	40	22	26.4	1,620	B.
September	28	19	22.4	1,330	B.
October	44	22	31.2	1,920	B.
November	44	32	37.1	2,210	B.
December	.....	.....	36.5	2,240	C.
The period	.....	.....	.....	41,200	

MILK RIVER BASIN.

SOUTH FORK OF MILK RIVER NEAR BROWNING, MONT.

Location.—In the SW. ¼ sec. 29, T 37 N., R. 9 W., at Richard Croff's ranch, just above Kennedy Coulee, about 40 miles northeast of Browning, Mont., and about 6 miles south of t international boundary line.

Records available.—April 28, 1905, to December 31, 1913.

Drainage area.—288 square miles. (Measurement revised.)

Gage.—Overhanging chain and Stevens automatic, installed April 13, 1913.

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Control.—Permanent.

Discharge measurements.—Made from a cable or by wading.

Winter flow.—Affected by ice.

Flood discharge.—River overflows its banks at gage height of 12 feet; high-water marks show that the flood of June, 1908, reached a stage of 15.4 feet on the gage. The flood width was 850 feet and the cross section about 2,600 square feet.

Diversions.—No diversions and no storage above the station.

Accuracy.—Records excellent except during the winter months.

Cooperation.—This station is maintained in cooperation with the Irrigation Office, Department of the Interior, Canada, during 1913.

Discharge measurements of South Fork of Milk River near Browning, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
May 20	W. A. Lamb	4.43	445	July 27	J. M. Ray	3.05	87
21	F. R. Burfield	4.14	373	Aug. 29	F. R. Burfield	2.56	21.2
21	W. A. Lamb	4.14	370	Sept. 13	W. A. Lamb	2.51	18.1
June 15	R. K. Randell	3.42	148	Oct. 12	L. Danielson	2.90	73.2
25	F. R. Burfield	3.16	102	Nov. 18	do	2.80	39.9
July 9	do	2.99	81	Dec. 20	W. A. Lamb	2.45	11.9
23	do	2.80	50.4				

Daily gage height, in feet, of South Fork of Milk River near Browning, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3.60	4.02	3.50	2.80	2.58	2.55	.....	2.66
2	.....	3.64	3.94	3.35	2.76	2.57	2.55	.....	2.60
3	.....	3.80	3.90	3.27	2.72	2.56	2.57	.....	2.62
4	.....	3.67	3.84	3.25	2.73	2.53	2.68	.....	2.61
5	.....	3.60	3.75	3.27	2.71	2.52	2.71	.....	2.63
6	.....	3.59	3.69	3.20	2.70	2.48	2.70	.....	2.67
7	.....	3.68	3.63	3.12	2.75	2.47	2.74	.....	2.63
8	.....	3.74	3.57	3.08	2.77	2.47	2.77	.....	2.60
9	.....	3.63	3.55	3.04	2.96	2.46	2.88	.....	2.60
10	.....	3.60	3.58	2.98	3.15	2.47	2.76	.....	2.56
11	.....	3.78	3.61	3.00	3.05	2.48	2.79	.....	2.64
12	.....	4.00	3.52	3.05	2.89	2.51	2.9	.....	2.66
13	5.55	4.01	3.45	3.01	2.81	2.48	3.3	.....	2.69
14	5.5	4.00	3.40	2.97	2.81	2.49	3.2	.....	2.69
15	5.2	3.93	3.40	2.92	2.83	2.50	2.95	.....	2.65
16	5.05	3.88	3.36	2.90	2.80	2.50	2.8	.....	2.66
17	4.6	4.16	3.30	2.86	2.78	2.50	2.8	.....	2.62
18	4.45	4.10	3.27	2.85	2.78	2.50	2.6	2.75	2.60
19	4.8	4.54	3.27	2.83	2.80	2.54	2.7	2.80	2.54
20	4.75	4.40	3.37	2.80	2.76	2.55	2.9	2.52	2.48
21	4.8	4.17	3.38	2.81	2.70	2.58	3.15	2.60	.....
22	4.65	4.16	3.24	2.80	2.68	2.62	3.26	2.65	.....
23	3.9	4.24	3.21	2.85	2.64	2.70	3.07	2.71	.....
24	3.9	4.18	3.21	2.80	2.60	2.72	2.81	2.77	.....
25	3.8	4.17	3.15	2.80	2.58	2.70	2.67	2.81	.....
26	3.8	4.22	3.36	2.80	2.57	2.65	2.70	2.79	.....
27	4.13	4.30	4.05	3.05	2.57	2.62	2.70	2.74	.....
28	4.11	4.32	4.23	2.92	2.57	2.60	2.64	2.68	.....
29	3.93	4.26	4.04	2.88	2.56	2.56	2.58	2.67	.....
30	3.66	4.19	3.71	2.86	2.55	2.55	.....	2.70	.....
31	.....	4.08	.....	2.86	2.55	.....	.....	.....	.....

NOTE.—Gage out of order Oct. 30-Nov. 17. Gage removed for winter on Dec. 20. Gage heights after Dec. 10 affected by ice in stream.

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Daily discharge, in second-feet, of South Fork of Milk River near Browning, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	196	315	173	50	25	22	.....	34
2	.....	206	289	141	45	24	22	.....	27
3	.....	248	277	125	40	23	24	.....	29
4	.....	214	260	122	42	21	36	.....	28
5	.....	196	234	125	39	20	39	.....	38
6	.....	194	218	112	38	17	38	.....	35
7	.....	216	204	98	44	16	43	.....	30
8	.....	232	189	92	46	16	46	.....	27
9	.....	204	184	85	73	15	61	.....	27
10	.....	196	191	76	104	16	45	.....	23
11	.....	243	198	79	87	17	49	.....	.....
12	.....	308	178	87	62	19	64	.....	.....
13	861	311	162	81	51	17	131	.....	.....
14	815	308	151	74	51	17	112	.....	.....
15	734	286	151	67	54	18	72	.....	.....
16	678	271	143	64	50	18	50	.....	.....
17	516	361	131	58	48	18	50	.....	.....
18	462	341	125	57	48	18	27	44	.....
19	588	494	125	54	50	22	38	50	.....
20	570	445	145	50	45	22	64	20	.....
21	588	365	147	51	38	25	104	27	.....
22	534	361	120	50	36	29	123	22	.....
23	277	389	114	57	31	38	90	39	.....
24	277	368	114	50	27	40	51	46	.....
25	248	365	104	50	25	38	35	51	.....
26	248	382	143	50	24	32	38	49	.....
27	351	410	324	87	24	29	38	43	.....
28	344	417	386	67	24	27	31	36	.....
29	286	396	321	61	23	23	25	35	.....
30	211	372	224	58	22	22	25	38	.....
31	.....	334	.....	58	22	.....	25	.....	.....

NOTE.—Discharge determined from a well-defined curve. Discharge Oct. 30-31, estimated; mean discharge Nov. 1-17, estimated 25 second feet; Dec. 11-31, 15 second-feet.

Monthly discharge of South Fork of Milk River near Browning, Mont., for 1913.

[Drainage area, 288 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
April	864	211	479	1.66	1.11	17,100	A.
May	494	196	311	1.08	1.24	19,100	A.
June	386	104	196	.680	.76	11,700	A.
July	173	50	79.3	.275	.32	4,880	A.
August	104	22	44.0	.153	.18	2,700	A.
September	40	15	22.7	.079	.09	1,350	A.
October	131	22	52.2	.181	.21	3,210	B.
November	51	20	31.2	.108	.12	1,860	C.
December	34	15	19.5	.068	.08	1,200	C.
The period	.....	.....	.....	.....	.....	63,100	

MILK RIVER AT INTERNATIONAL BOUNDARY.

Location.—In the SE. ¼ sec. 1, T. 1, R. 5 W. fourth meridian, Alberta, Canada, at international boundary line, 30 miles north of Rudyard, Mont., the nearest railroad station.

Records available.—April 1 to December 31, 1913. From August 7, 1909 to 1912 station was maintained by the Canadian Department of the Interior.

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Drainage area.—2,448 square miles.

Gage.—Gurley automatic gage on left bank, installed August 13, 1913. At the station maintained by the Canadian officials readings were obtained from a staff gage on the right bank, about 1,000 feet above the present gage.

Control.—Likely to shift.

Discharge measurements.—Made from a cable about 1,000 feet above gage; low-water measurements made by wading at the gage.

Winter flow.—Affected by ice.

Accuracy.—Records good.

Cooperation.—Maintained in cooperation with the Irrigation Office, Department of the Interior, Canada, during 1913.

Discharge measurements of Milk River at international boundary in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 26	J. E. Degnan	[a] 3.58	572	Aug. 13	J. E. Degnan	[b] 2.98	60
28	....do	[a] 3.26	403	13	J. B. Stewart	[b] 2.95	59
May 16	....do	[a] 3.45	508	Sept. 4	J. E. Degnan	[b] 2.56	34
18	J. B. Stewart	[a] 3.45	470	18	....do	[b] 2.42	22
30	J. E. Degnan	[a] 3.70	518	Oct. 8	....do	[b] 2.80	55
June 18	....do	[a] 2.71	205	24	....do	[b] 3.05	74
July 8	....do	[a] 2.72	165	Nov. 7	....do	[b] 2.97	55
22	J. B. Stewart	[a] 2.23	81	9	W. A. Lamb	[b] 3.14	85
25	J. E. Degnan	[a] 2.16	84	Dec. 24	....do	[b] 2.95	14.7

[a] Gage height from rod near cable. [b] Gage height from rod at automatic gage.

Daily gage height, in feet, of Milk River at international boundary for 1913.

[Frank Galloway, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5.50	3.63	3.67	3.74	2.12	2.75	2.76	3.02	3.22
2	5.55	3.51	3.70	3.63	2.11	2.72	2.74	3.09	3.24
3	4.23	3.41	3.65	3.55	2.11	2.60	2.71	3.03	3.30
4	5.80	3.25	3.60	3.16	2.10	2.55	2.70	3.03	3.30
5	5.60	3.32	3.38	2.99	2.12	2.53	2.77	3.08	3.30
6	4.27	3.28	3.24	2.86	2.13	2.50	2.86	3.08	3.30
7	4.55	3.27	3.19	2.75	2.13	2.48	2.87	3.06	3.30
8	4.61	3.29	3.14	2.72	2.13	2.47	2.82	3.07	3.30
9	4.45	3.23	3.10	2.68	2.14	2.46	2.83	3.14	3.30
10	4.18	3.18	3.07	2.65	2.14	2.46	2.89	3.18	3.28
11	4.20	3.22	3.05	2.62	2.08	2.46	2.88	3.10	3.28
12	4.42	3.26	2.95	2.56	2.08	2.44	2.86	3.08	3.28
13	4.50	3.29	3.00	2.48	2.98	2.43	2.88	3.00	3.28
14	4.55	3.20	2.89	2.45	3.40	2.43	2.88	2.85	3.28
15	4.52	3.32	2.87	2.45	3.56	2.43	2.90	3.25	3.28
16	4.48	3.42	2.86	2.42	3.35	2.42	2.89	3.15	3.28
17	4.41	3.46	2.75	2.34	3.18	2.43	2.97	3.40	3.38
18	4.18	3.45	2.72	2.33	4.58	2.43	3.30	3.26	3.38
19	4.25	3.46	2.70	2.31	4.41	2.45	3.30	3.24	3.38
20	4.10	3.66	2.90	2.32	4.01	2.45	3.22	3.18	3.37
21	4.04	3.52	2.87	2.30	3.63	2.48	3.15	2.98	3.00
22	4.10	3.93	2.83	2.15	3.29	2.54	3.08	3.44	2.45
23	4.05	3.74	2.79	2.17	3.12	2.62	3.05	3.10	2.09
24	3.97	3.65	2.84	2.17	3.04	2.58	3.05	3.11	.....
25	3.75	3.58	2.88	2.16	2.98	2.58	3.03	3.12	2.00
26	3.58	3.60	2.76	2.16	2.93	2.63	3.02	3.13	.....
27	3.37	3.57	2.83	2.14	2.89	2.66	3.00	3.14	.....
28	3.29	3.56	3.23	2.14	2.86	2.65	3.02	3.15	.....
29	3.32	3.56	2.94	2.12	2.82	2.70	3.01	3.16	.....
30	3.45	3.67	2.89	2.12	2.80	2.76	3.04	3.18	.....
31	.....	3.65	.....	2.11	2.77	.....	2.92	.....	.....

NOTE.—Discharge relation affected by ice Apr. 1-10 and after Nov. 30.

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Daily discharge, in second-feet, of Milk River at international boundary for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	60	642	676	739	70	50	51	65
2	105	550	702	642	69	47	49	70
3	130	484	658	580	69	36	46	84
4	330	398	618	353	66	32	46	88
5	490	434	467	277	70	31	52	98
6	550	414	393	229	72	28	60	95
7	680	408	368	192	72	27	61	95
8	720	419	343	184	72	26	56	71
9	1,078	388	325	175	73	25	58	85
10	1,259	363	311	166	73	25	62	80
11	1,287	388	302	161	66	25	61	82
12	1,634	403	261	148	66	24	59	80
13	1,771	419	231	131	61	23	61	72
14	1,858	373	239	125	99	23	61	58
15	1,806	434	232	121	115	23	62	46
16	1,737	490	229	119	96	22	61	36
17	1,617	516	192	104	82	23	68	105
18	1,259	509	184	102	207	23	98	96
19	1,362	516	179	99	193	24	97	94
20	1,149	667	243	101	158	24	90	99
21	1,070	557	232	97	125	27	84	71
22	1,149	937	218	74	95	31	77	112
23	1,062	739	205	77	80	38	74	82
24	984	658	222	77	74	35	74	95
25	748	603	236	75	69	35	71	94
26	603	618	195	75	66	39	70	85
27	461	595	218	73	62	42	67	86
28	419	587	388	73	60	41	67	86
29	434	587	257	70	56	46	66	87
30	509	676	239	70	54	51	67	89
31	.....	658	.....	69	52	.....	56	.....

NOTE.—Discharge determined from two fairly well defined curves and by indirect method for shifting channels.

Monthly discharge of Milk River at international boundary for 1913.

[Drainage area, 2,448 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
April	1,858	60	944	0.385	0.431	56,172	B.
May	937	363	530	.217	.250	32,588	B.
June	702	179	320	.131	.146	19,041	B.
July	739	69	180	.074	.085	11,068	B.
August	216	52	85	.035	.040	5,214	B.
September	51	22	32	.013	.014	1,874	B.
October	98	46	66	.027	.031	4,027	B.
November	112	59	81	.033	.037	4,814	B.
The period	.....	.....	.....	.....	.....	134,796	

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MILK RIVER AT HAVRE, MONT.

ocation.—In the SE. ¼ SE. ¼ sec. 5, T. 32 N., R. 16 E., at the highway bridge over Milk River at Havre, Mont.

ecords available.—May 15, 1898, to December 31, 1913.

rainage area.—Not accurately determined.

age.—Chain fastened to bridge rail on the downstream side.

ontrol.—Shifts.

ischarge measurements.—Made from bridge or by wading.

inter flow.—From the last part of November to the first part of April the river at Havre is frozen entirely over and in portions of the cross section it is usually frozen to the bottom.

iversions.—An irrigation company in southern Alberta, Canada, has been granted an appropriation of 500 second-feet of the low-water flow and 1,500 second-feet of the high-water flow, and a canal of 330 second-feet capacity has been partly constructed but no water has been diverted. There are no other important irrigation rights above Havre, but farther downstream are five large canal systems supplied directly from Milk River and irrigating about 22,000 acres. Preliminary steps toward the adjudication of the water rights of these various systems have been taken. A suit in behalf of the Fort Belknap Indians was decided in their favor, with the result that they were given a prior right over the other canals to 125 second-feet, the priority of the other rights not being touched upon. Although no provision for storage has been made by the above claimants, the entire unappropriated flow of the stream has been filed upon by the United States Reclamation Service in connection with its Milk River irrigation project now under construction.

ccuracy.—Frequent discharge measurements are necessary to properly define the rating curve, and even with these the estimates are subject to considerable error. In years of low precipitation the flow ceases entirely and the water stands in pools for several months.

Discharge measurements of Milk River at Havre, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
ar. 19	R. R. Randell	a 7.35	92	July 12	J. B. Stewart	6.35	175
pr. 30	J. B. Stewart	7.25	572	21	do	5.94	96
ay 17	do	7.50	756	26	do	5.78	73
me 5	do	7.05	467	Aug. 8	do	5.58	46
29	do	7.13	411	12	do	5.67	42
ly 3	do	7.15	539	Sept. 19	W. A. Lamb	4.94	10
9	do	6.50	206	Oct. 30	do	5.70	61

a Ice present.

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Daily gage height, in feet, of Milk River at Havre, Mont., for 1913.

[C. W. Ling, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	7.8	7.2	7.1	6.9	5.5	5.5	5.2	5.7	5.7
2	.....	8.4	7.5	7.2	7.2	5.4	5.5	5.2	5.7	5.7
3	.....	7.7	7.3	7.2	7.1	5.5	5.4	5.4	5.7	5.8
4	.....	7.9	7.3	7.3	7.2	5.5	5.3	5.4	5.7	5.8
5	.....	8.2	7.0	7.1	7.1	5.5	5.2	5.4	5.8	5.8
6	.....	8.5	7.1	6.9	7.1	5.7	5.2	5.4	5.8	5.8
7	.....	8.5	6.9	6.8	6.4	5.8	5.2	5.7	5.8	5.8
8	.....	9.3	7.0	6.8	6.5	5.7	5.1	5.7	5.8	5.8
9	.....	9.0	6.9	6.7	6.3	5.6	5.1	5.7	5.8	5.8
10	.....	8.8	7.0	6.7	6.4	5.6	5.1	5.7	5.8	.....
11	9.0	8.2	6.9	6.7	6.3	5.8	5.1	5.7	5.8	.....
12	8.0	8.4	7.0	6.6	6.2	5.7	5.0	5.7	5.8	.....
13	7.7	8.5	6.9	6.7	6.2	5.7	5.0	5.6	5.7	.....
14	7.0	9.2	8.0	6.6	6.1	5.7	5.0	5.6	5.7	.....
15	7.0	9.7	7.5	6.8	6.2	5.8	5.0	5.6	5.7	.....
16	7.0	9.4	7.6	6.6	6.0	5.7	5.0	5.7	5.7	.....
17	7.0	9.3	7.4	6.6	6.1	5.7	4.9	5.7	5.7	.....
18	7.0	9.0	7.4	7.1	5.8	6.2	4.8	5.6	5.7	.....
19	7.4	8.5	7.3	6.6	5.9	6.2	4.8	5.7	5.7	.....
20	.....	8.3	7.4	6.4	5.8	7.5	4.8	5.7	5.7	.....
21	.....	8.0	7.3	6.6	5.9	6.8	4.8	5.7	5.7	.....
22	.....	7.7	7.5	6.8	5.8	6.5	4.9	6.1	5.8	.....
23	.....	8.3	7.4	6.7	5.9	6.3	4.8	6.1	5.8	.....
24	.....	8.1	7.6	6.4	5.7	6.1	4.8	6.1	5.8	.....
25	.....	7.7	7.5	6.5	5.7	6.1	4.8	5.9	5.8	.....
26	.....	7.6	7.3	6.6	5.7	5.9	5.3	5.9	5.8	.....
27	.....	7.6	7.2	6.5	5.5	5.8	5.3	5.9	5.8	.....
28	.....	7.6	7.3	6.7	5.6	5.6	5.2	5.8	5.7	.....
29	.....	7.6	7.1	7.4	5.4	5.6	5.2	5.8	5.7	.....
30	.....	7.3	7.2	7.3	5.4	5.6	5.3	5.7	5.7	.....
31	8.4	.....	.....	.....	5.4	5.5	.....	5.7	.....	.....

NOTE.—On Apr. 30 it was found that a sand bar had formed under the chain gage and a temporary staff gage was installed on the right abutment of the bridge, to read the same as the chain gage. This staff gage was read Apr. 30 to June 5. Gage heights Mar. 11-19 are affected by ice.

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Daily discharge, in second-feet, of Milk River at Havre, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	945	565	505	395	38	38	20	58	58
2	.....	1,370	750	565	565	31	38	20	58	58
3	.....	880	625	565	505	38	31	31	58	70
4	.....	1,010	625	625	565	38	25	31	58	70
5	.....	1,220	450	505	505	38	20	31	70	70
6	.....	1,450	505	395	505	58	20	31	70	70
7	.....	1,450	395	345	195	70	20	58	70	70
8	.....	2,160	450	345	225	58	15	58	70	70
9	.....	1,880	395	300	170	43	15	58	70	70
10	.....	1,700	450	300	195	40	15	58	70	.....
11	.....	1,220	395	300	170	56	15	58	70	.....
12	.....	1,370	450	260	145	42	12	58	70	.....
13	.....	1,450	395	300	145	42	12	47	58	.....
14	.....	2,060	1,060	260	123	43	12	47	58	.....
15	.....	2,540	750	345	145	66	12	47	58	.....
16	.....	2,260	815	260	104	45	12	58	58	.....
17	.....	2,160	685	260	123	46	9	58	58	.....
18	.....	1,880	685	505	70	123	7	47	58	.....
19	.....	1,450	625	260	86	125	7	58	58	.....
20	.....	1,300	685	195	70	698	7	58	58	.....
21	.....	1,080	625	260	86	314	7	58	58	.....
22	.....	880	750	345	70	207	9	123	70	.....
23	.....	1,300	685	300	86	150	7	123	70	.....
24	.....	1,150	815	195	58	119	7	123	70	.....
25	.....	880	750	225	58	121	7	86	70	.....
26	.....	815	625	260	58	86	25	86	70	.....
27	.....	815	565	225	38	70	25	86	70	.....
28	.....	815	625	300	47	47	20	70	58	.....
29	.....	815	505	685	31	47	20	70	58	.....
30	.....	625	565	625	31	47	25	58	58	.....
31	1,370	.....	535	.....	31	38	.....	58	.....	.....

NOTE.—Discharge determined from a well-defined rating curve except for the period Aug. 9–25, when the indirect method for shifting channels was used.

Monthly discharge of Milk River at Havre, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	2,540	625	1,360	80,900	A.
May	1,080	395	607	37,300	A.
June	685	195	360	21,400	A.
July	565	31	181	11,100	A.
August	698	31	96.3	5,920	B.
September	38	7	16.5	982	B.
October	123	20	60.4	3,710	A.
November	70	58	63.6	3,780	A.
December 1–9	70	58	67.3	1,200	A.
The period	.....	.....	.....	166,000	

NOTE.—Accuracy for September is reduced because of some doubt as to the accuracy of observer's readings.

MILK RIVER AT MALTA, MONT.

Location.—In the NW. ¼ sec. 17, T. 30 N., R. 30 E., at the old highway bridge at Malta, Mont.

Records available.—July 31, 1902, to December 31, 1913.

Drainage area.—Not accurately determined.

Gage.—Chain fastened to handrail on downstream side of bridge.

Control.—Sandy; shifts during floods.

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Discharge measurements.—Made from bridge or by wading.

Winter flow.—More or less ice present during winter months.

Diversions.—The entire run-off from the drainage area above does not pass the station, for between Havre and Malta seven irrigation canals, which irrigate about 25,000 acres of land, divert water from Milk River and its tributaries. The United States Reclamation Service has constructed a diversion dam at Dodson, about 17 miles above the station, which will eventually divert water for the irrigation of about 108,000 acres of land in Milk River Valley. East of Malta there are nearing completion two canals, one on each side, the combined discharge being 1,000 second-feet.

Discharge measurements of Milk River at Malta, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 21	R. R. Randell	a 3.30	266	July 15	J. B. Stewart	2.23	218
Apr. 24	J. B. Stewart	5.05	2,050	28	do	1.34	49
May 5	do	3.65	975	Aug. 1	do	1.11	29
22	do	3.78	968	Sept. 19	W. Lamb	1.20	27
June 18	do	2.37	318	Nov. 13	do	1.89	152

a Ice present.

Daily gage height, in feet, of Milk River at Malta, Mont., for 1913.

[D. P. Burkhart, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		3.6		2.55	1.0	1.55	1.2	2.3	
2		3.7		3.0	.9	1.55	1.2	1.9	
3		3.6		3.0	.8	1.55	1.2	1.9	
4		3.7	2.7	3.15	.8		1.2	1.8	
5		3.6		3.0	1.0	1.38	1.2	1.8	
6	6.0	3.6		3.0	1.0	1.38	1.3	1.8	
7	5.8	3.5		3.3	1.0	1.29	1.3	1.9	
8	5.8	3.3	2.5	3.5	1.2	1.20	1.3	1.9	
9	5.9	3.2	2.5	3.3	1.2	1.2	1.3	1.9	
10	6.0		2.4	2.85	1.2	1.2	1.3	1.9	
11	6.2		2.4	2.4	1.2	1.2	1.3	1.9	1.6
12	5.7			2.25	1.2	1.2	1.3	1.9	
13	5.7			2.25	1.2	1.2	1.4	1.9	1.5
14	5.6		2.4	2.25	1.0	1.2	1.4	1.9	
15	6.3			1.90	1.0	1.2	1.45	1.9	
16			2.4	1.72	1.0	1.2	1.55	1.9	1.5
17	7.8			1.72	1.0	1.2	1.7	1.9	
18	8.3			1.72	.8	1.2	1.6	1.9	
19	8.2		2.5	1.72	.8	1.20	1.6	1.9	
20	7.4		2.25	1.55	1.2	1.38	1.6	1.9	
21	7.3		2.25	1.55	1.0	1.20	1.6	1.9	
22	5.7		2.55	1.55	1.0	1.25	1.6	1.9	
23	5.2		2.55	1.38		1.2	1.6	1.9	
24	5.0		2.85	1.38	1.9	1.2	1.7	1.8	
25	4.9		2.55	1.38	1.9	1.2	1.7	1.8	
25	4.9		2.55	1.38	1.9	1.3	1.7	1.8	
27	4.6		2.55	1.20	1.90	1.3	1.7	1.7	
28	4.2		2.4	1.20	1.73	1.3	1.8	1.7	
29	4.0		2.4	1.20	1.73	1.3	1.9	1.6	
30	3.8		2.7	1.20	1.55	1.3	2.1	1.6	
31				1.00	1.55		2.5		

NOTE.—Gage heights June 10 to Sept. 21 read on a chain gage at the new highway bridge, about 300 yards above the station. The gage heights as published have been computed for the station gage from a curve showing the relation between the two gages. Ice present at the station previous to Apr. 6, from Dec. 1-10, and after Dec. 16.

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Daily discharge, in second-feet, of Milk River at Malta, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	988	.....	382	17	76	31	281	.....
2	.....	1,060	.....	601	8	76	31	152	.....
3	.....	988	.....	601	8	76	31	152	.....
4	.....	1,060	448	688	8	64	31	127	.....
5	.....	988	426	601	17	51	31	127	.....
6	2,650	988	404	601	17	51	41	127	.....
7	2,520	916	382	781	17	40	41	152	.....
8	2,520	781	360	916	31	31	41	152	.....
9	2,580	718	360	781	31	31	41	152	.....
10	2,650	.....	319	522	31	31	41	152	.....
11	2,780	.....	319	319	31	31	41	152	85
12	2,450	.....	319	263	31	31	41	152	.....
13	2,450	.....	319	263	31	31	53	152	C8
14	2,380	.....	319	263	17	31	53	152	.....
15	2,860	.....	319	152	17	31	60	152	.....
16	3,330	.....	319	109	17	31	76	152	C8
17	3,800	.....	319	109	17	31	105	152	.....
18	4,100	.....	318	109	8	31	85	152	.....
19	4,040	.....	360	109	8	31	85	152	.....
20	3,560	.....	263	76	31	51	85	152	.....
21	3,500	.....	263	76	17	31	85	152	.....
22	2,450	968	382	76	17	36	85	152	.....
23	2,100	.....	382	51	84	31	85	152	.....
24	1,960	.....	522	51	152	31	105	127	.....
25	1,900	.....	382	51	152	31	105	127	.....
26	1,900	.....	382	51	152	41	105	127	.....
27	1,680	.....	382	31	152	41	105	105	.....
28	1,410	.....	319	31	112	41	127	105	.....
29	1,280	.....	319	31	112	41	152	85	.....
30	1,140	.....	448	31	76	41	211	85	.....
31	.....	.....	.....	17	76	.....	360	.....	.....

NOTE.—Discharge determined from a fairly well-defined rating curve. Discharge estimated as follows, from records of flow at Hinsdale and Havre: May 10–21, at 1,260 second-feet; May 23–31, at 975 second-feet; June 1–3, at 550 second-feet. Discharge interpolated for other periods for which gage heights are missing.

Monthly discharge of Milk River at Malta, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 6–30	4,100	1,140	2,560	127,000	B.
May	.....	.....	1,080	66,400	D.
June	.....	.....	377	22,400	C.
July	916	17	282	17,300	C.
August	152	8	48.2	2,960	C.
September	76	31	40.7	2,420	C.
October	360	31	82.9	5,100	B.
November	281	85	144	8,570	B.
The period	.....	.....	.....	252,000	

NOTE.—Accuracy for June, July, August, and September reduced on account of method of obtaining gage heights.

MILK RIVER AT HINSDALE, MONT.

Location.—In the NE. ¼ SW. ¼ sec. 33, T. 31 N., R. 36 E., at the highway bridge over Milk River about 1 mile from Hinsdale, Mont., a point 46 miles from the junction of Milk River with the Missouri.

Records available.—May 13, 1908, to December 31, 1913.

Drainage area.—Not accurately determined.

Gage.—Chain fastened to upstream side of highway bridge.

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Discharge measurements.—Made from bridge or by wading.

Winter flow.—Stream frozen entirely across and to a considerable depth from late in November until the first of April.

Diversions.—No water is diverted between the station at Hinsdale and that at Malta. The flow of the stream has, however, been appropriated by the United States Reclamation Service in connection with the Milk River project, and will be diverted at a point 9 miles east of Hinsdale to irrigate land in lower Milk River valley.

Discharge measurements of Milk River at Hinsdale, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 24	R. R. Randell	[a] 3.22	338	June 19	J. B. Stewart	3.40	664
Apr. 23	J. B. Stewart	6.92	2,930	July 20	do	2.45	216
May 6	do	4.37	1,110	Aug. 1	do	1.73	92
23	do	4.03	1,280	Sept. 20	W. A. Lamb	1.35	30

[a] Ice present.

Daily gage height, in feet, of Milk River at Hinsdale, Mont., for 1913.

[Goldie Wooldridge, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	4.8	3.9	3.7	1.77	2.01	1.4	.....
2	.....	4.6	3.6	3.9	1.72	1.91	1.4	.....
3	.....	4.5	3.8	3.6	1.67	1.80	1.35	.....
4	12.4	4.5	3.6	3.7	1.61	1.80	1.4	.....
5	11.8	4.4	3.3	.....	1.66	1.70	1.4	.....
6	.....	4.4	3.2	4.4	1.56	1.70	1.4	.....
7	10.8	4.4	3.2	4.2	1.61	1.70	1.4	2.1
8	9.4	4.3	3.1	4.1	1.64	1.59	1.4	2.0
9	8.4	4.0	3.0	4.1	1.65	1.59	1.4	2.0
10	7.4	3.8	2.9	.....	1.65	1.49	1.5	2.0
11	7.0	4.0	2.9	.....	1.65	1.49	1.5	2.0
12	7.0	3.9	3.15	.....	1.65	1.49	1.5	2.0
13	7.0	3.8	3.1	.....	1.65	1.48	1.5	1.9
14	7.0	4.0	3.1	.....	1.64	1.48	1.6	1.9
15	7.0	4.0	3.0	.....	1.64	1.38	1.7	.....
16	7.0	4.2	3.0	.....	2.04	1.38	1.7	.....
17	8.4	4.1	3.3	.....	2.04	1.38	1.6	.....
18	8.9	4.1	3.2	.....	1.94	1.37	1.5	.....
19	.....	6.0	4.1	.....	1.83	1.27	1.5	.....
20	9.0	7.8	5.0	2.45	1.73	1.30	1.6	.....
21	8.4	7.8	4.6	2.39	1.73	1.3	1.6	.....
22	7.7	4.8	4.0	2.39	1.73	1.2	1.7	.....
23	6.0	4.6	4.3	2.29	1.73	1.2	1.8	.....
24	6.5	4.5	4.1	2.19	1.72	1.3	1.8	.....
25	6.1	4.4	4.0	1.99	1.72	1.3	.....	.....
26	5.9	4.4	3.8	1.98	1.67	1.3	.....	.....
27	5.7	4.4	3.6	1.98	1.67	1.3	.....	.....
28	5.5	4.4	3.4	2.98	1.62	1.3	.....	.....
29	5.3	4.4	3.4	1.98	2.41	1.3	.....	.....
30	5.0	4.4	3.4	1.88	1.93	1.35	.....	.....
31	.....	4.2	.....	1.82	2.11	.....	.....	.....

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Daily discharge, in second-feet, of Milk River near Hinsdale, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	1,430	880	770	86	122	40	.....
2	.....	1,300	720	880	78	106	40	.....
3	.....	1,240	820	720	70	90	35	.....
4	7,380	1,240	720	770	62	90	40	.....
5	6,820	1,180	570	975	69	75	40	.....
6	6,370	1,180	530	1,180	56	75	40	.....
7	5,920	1,180	530	1,060	62	75	40	140
8	4,720	1,120	475	1,000	66	59	40	120
9	3,930	940	430	1,000	68	59	40	120
10	3,210	820	390	.....	68	49	50	120
11	2,930	940	390	.....	68	49	50	120
12	2,930	880	498	.....	68	49	50	120
13	2,930	820	475	.....	68	48	50	105
14	2,930	940	475	.....	66	48	60	105
15	2,930	940	430	.....	66	38	75	.....
16	2,930	1,060	430	.....	128	38	75	.....
17	3,930	1,000	570	.....	128	38	60	.....
18	4,320	1,000	520	.....	111	37	50	.....
19	4,300	2,230	1,000	.....	94	27	50	.....
20	4,400	3,490	1,560	225	80	30	60	.....
21	3,930	3,490	1,300	208	80	30	60	.....
22	3,420	1,430	940	208	80	20	75	.....
23	2,230	1,300	1,120	182	80	20	90	.....
24	2,580	1,240	1,000	158	78	30	90	.....
25	2,300	1,180	940	118	78	30	.....	.....
26	2,160	1,180	820	117	70	30	.....	.....
27	2,020	1,180	720	117	70	30	.....	.....
28	1,880	1,180	620	422	63	30	.....	.....
29	1,760	1,180	620	117	213	30	.....	.....
30	1,560	1,180	620	102	110	35	.....	.....
31	.....	1,060	.....	93	142	.....	.....	.....

NOTE.—Discharge determined from a fairly well defined rating curve which is the same as for 1912 above gage height 3.8 feet. July 10–19, discharge estimated at 80 second-feet. Discharge interpolated for days for which gage heights are missing.

Monthly discharge of Milk River at Hinsdale, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 4–30	7,380	1,560	3,580	192,000	B.
May	3,490	820	1,310	80,600	B.
June	1,560	390	703	41,800	B.
July	1,180	93	459	28,200	C.
August	213	56	84.7	5,210	B.
September	122	20	49.6	2,950	B.
October 1–24	90	35	54.2	2,580	B.
The period	.....	.....	.....	353,000	

NORTH FORK OF MILK RIVER NEAR KIMBALL, ALBERTA.

Location.—At the Peters ranch, 18 miles east of Kimball, Alberta, and about 2 miles north of the international boundary.

Records available.—January 1 to December 31, 1913. A station was maintained by irrigation office department of the interior, Canada, in the NE. ¼ sec. 13, T. 1, R. 23 W. fourth meridian, about 2 miles downstream, from July 21, 1909, to December 31, 1912. A station was maintained at Alexander Dubray's ranch, 2 miles south of the international boundary, May 8, 1911, to December 31, 1912.

Drainage area.—101 square miles.

Gage.—Stevens automatic gage on left bank.

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Control.—Permanent.

Discharge measurements.—Made by wading at convenient sections near the gage at low water and from a cable 2 miles below the gage at high water.

Winter flow.—Affected by ice.

Accuracy.—Results good.

Cooperation.—Maintained during 1913 in cooperation with the irrigation office department of the interior, Canada.

Discharge measurements of North Fork of Milk River near Kimball, Alberta, in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
May 2	F. R. Burfield	2.05	49.2	July 28	W. A. Lamb	1.80	22
20	W. A. Lamb	2.32	82	Aug. 11	F. R. Burfield	1.84	27.3
23	F. R. Burfield	2.24	66	29	do	1.74	18.3
June 7	do	1.94	35.4	Sept. 13	W. A. Lamb	1.74	17.1
14	R. R. Randell	1.87	30	Oct. 25	do	1.84	23
24	F. R. Burfield	1.84	29	Nov. 25	J. E. Degnan	1.81	27.3
26	do	2.31	76.2	Dec. 6	do	1.76	20.2
July 9	do	1.77	21.7	17	do	1.69	14.6
23	do	1.77	21.8	31	do	2.12	14.1

NOTE.—All discharge measurements are referred to the automatic gage.

Daily gage height, in feet, of North Fork of Milk River, near Kimball, Alberta, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.58	3.18	3.69	4.02	2.03	2.04	1.99	1.74	2.15	1.87	1.83	1.75
2	2.62	3.17	3.66	4.07	2.05	2.01	1.89	1.73	2.12	1.86	1.84	1.74
3	2.63	3.24	3.68	4.06	2.12	2.00	1.83	1.74	2.11	1.86	1.90	1.79
4	2.60	3.34	3.71	4.13	2.20	2.00	1.88	1.74	2.11	1.87	1.95	1.76
5	2.69	3.38	3.82	4.43	2.01	1.96	1.86	1.74	2.10	1.87	1.82	1.74
6	2.66	3.42	4.03	4.55	1.99	1.95	1.80	1.73	2.10	1.87	1.81	1.77
7	2.52	3.44	4.64	4.85	2.07	1.95	1.78	1.72	2.09	1.87	1.80	1.73
8	2.46	3.42	5.26	4.96	2.04	1.96	1.74	1.84	2.08	1.88	1.80	1.74
9	2.39	3.36	5.41	4.76	1.98	1.95	1.77	2.03	2.07	1.89	1.80	1.78
10	2.33	3.29	5.22	4.85	2.00	1.99	1.75	1.84	2.07	1.90	1.79	1.79
11	2.11	3.32	5.05	5.26	2.15	1.96	1.81	1.84	2.05	1.92	1.80	1.75
12	2.24	3.32	5.54	5.74	2.14	1.98	1.81	1.80	2.03	2.25	1.78	1.76
13	2.30	3.35	4.04	5.48	2.13	1.90	1.78	1.78	2.02	2.09	1.90	1.78
14	2.64	3.37	4.03	5.03	2.08	1.89	1.76	1.81	2.03	1.98	2.01	1.77
15	2.65	3.40	4.01	3.97	2.07	1.87	1.76	1.79	2.01	1.90	1.90	1.74
16	2.70	3.73	3.99	3.07	2.15	1.85	1.76	1.78	1.99	1.88	1.78	1.74
17	2.68	4.21	3.97	2.99	2.32	1.84	1.75	1.79	2.00	1.89	1.77	1.75
18	2.70	4.25	3.95	2.84	2.40	1.84	1.74	1.83	1.99	1.88	1.77	1.84
19	2.78	4.28	3.93	2.78	2.44	1.88	1.74	1.80	2.00	1.84	2.04	1.87
20	2.32	4.28	3.91	2.76	2.32	2.08	1.73	1.79	1.98	1.84	1.94	1.89
21	2.26	4.29	3.89	2.50	2.28	1.91	1.73	1.77	1.99	1.80	1.84	1.79
22	2.32	4.22	3.87	2.21	2.29	1.85	1.74	1.75	2.15	1.81	1.86	1.84
23	2.41	4.04	3.84	2.10	2.23	1.85	1.77	1.75	1.94	1.79	1.83	1.85
24	2.56	3.90	3.82	2.01	2.18	1.84	1.74	1.74	1.89	1.80	1.80	1.97
25	2.59	3.52	3.83	2.07	2.17	1.95	1.78	1.74	1.82	1.79	1.79	2.04
26	2.75	3.76	3.83	2.04	2.18	2.10	2.02	1.74	1.75	1.78	1.84	2.05
27	2.84	3.73	3.87	2.01	2.18	2.25	1.88	1.74	1.75	1.77	1.83	2.09
28	2.89	3.73	3.94	1.98	2.16	2.29	1.80	1.73	1.75	1.80	1.82	2.19
29	2.92	.....	3.99	1.98	2.20	2.11	1.80	1.74	1.75	1.80	1.80	2.14
30	3.06	.....	3.90	2.00	2.08	2.11	1.82	2.15	1.80	1.80	1.79	2.18
31	3.09	.....	3.90	.....	2.05	.....	1.77	2.22	.....	1.98	.....	2.23

NOTE.—Gage heights Jan. 1–Apr. 30, and Aug. 30 to Sept. 22, were recorded by Canadian engineers at a station about 2 miles below the present site. Gage height May 1–Aug. 29 and Sept. 23–Dec. 31 were obtained from the automatic gage. Discharge relation affected by ice Jan. 1–Apr. 13 and Dec. 18–31.

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Daily discharge, in second-feet, of North Fork of Milk River near Kimball, Alberta, for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	12.6	17.4	22	24	46	47	42.0	18.7	24.0	30	26	19.5
2	13.0	17.4	21	32	48	44	32.0	17.9	24.0	29	27	18.8
3	13.0	17.9	21	40	56	43	26.0	18 7	23.0	29	33	23.0
4	12.8	18.7	22	48	45	43	31.0	18.7	24.0	30	38	20.0
5	13.5	19.0	23	56	44	39	29.0	18.7	24.0	30	26	18.8
6	13.3	19.4	24	64	42	38	24.0	17.9	25.0	30	25	21.0
7	12.2	19.5	29	72	51	38	22.0	17.0	25.0	30	24	17.9
8	11.7	19.4	34	80	47	39	18.7	27.0	25.0	31	24	18.8
9	11.1	18.9	35	90	41	38	21.0	46.0	25.0	32	24	22.0
10	10.6	18.3	34	100	43	42	19.5	27.0	25.0	33	23	23.0
11	8.9	18.6	32	140	59	39	25.0	27.0	25.0	35	24	19.5
12	9.9	18.6	28	180	58	41	25.0	24.0	25.0	71	22	20.0
13	10.4	18.8	24	220	57	33	22.0	22.0	26.0	53	33	22.0
14	13.1	19.0	24	278	52	32	20.0	25.0	25.0	41	44	21.0
15	13.2	19.2	24	172	51	30	20.0	23.0	25.0	33	33	18.8
16	13.6	22.0	24	93	59	28	20.0	22.0	25.0	31	22	18.8
17	13.4	26.0	24	87	79	27	19.5	23.0	26.0	32	21	19.5
18	13.6	26.0	24	76	88	27	18.7	26.0	26.0	31	21	14.6
19	14.2	26.0	23	72	93	31	18.7	24.0	27.0	27	47	14.5
20	10.6	26.0	23	70	79	52	17.9	23.0	26.0	27	37	14.5
21	10.1	26.0	23	54	74	34	17.9	21.0	27.0	24	27	14.5
22	10.6	26.0	23	39	75	28	18.7	19.5	34.0	25	29	14.5
23	11.3	24.0	23	35	68	28	21.0	19.5	37.0	23	26	14.4
24	12.5	23.0	23	31	63	27	18.7	18.7	32.0	24	24	14.4
25	12.7	20.0	23	34	62	38	22.0	18.7	25.0	23	23	14.3
26	14.0	22.0	23	32	63	54	45.0	18.7	19.5	22	27	14.3
27	14.7	22.0	23	31	63	71	31.0	18.7	19.5	21	26	14.3
28	15.1	22.0	24	30	61	75	24.0	17.9	19.5	24	26	14.3
29	15.4	.....	24	30	65	55	24.0	18.7	19.5	24	24	14.2
30	16.5	.....	23	31	52	55	26.0	24.0	24.0	24	23	14.2
31	16.7	.....	23	.....	48	.....	21.0	26.0	.....	41	.....	14.1

NOTE.—Discharges Jan. 1–Apr. 13, and Dec. 18–31, estimated by the office of the Canadian Commissioner of Irrigation, because of effect of ice on the relation of gage height to discharge. Discharge Apr. 14–30 and Aug. 30 to Sept. 22, obtained from gage heights recorded at a station maintained by the Canadian Government about 2 miles below the present station. Discharge May 1–Aug. 29 and Sept. 23–Dec. 17, determined from a well defined curve.

Monthly discharge of North Fork of Milk River near Kimball, Alberta, for 1913.

[Drainage area, 101 square miles.] [a]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
January	16.7	8.9	12.7	0.116	0.13	781	
February	26.0	17.4	21.1	.194	.20	1,172	
March	35.0	21.0	24.8	.228	.26	1,525	
April	278.0	24.0	78.0	.716	.80	4,641	
May	93.0	41.0	59.1	.585	.67	3,634	A.
June	75.0	27.0	40.5	.401	.45	2,410	A.
July	45.0	17.9	24.0	.238	.27	1,476	A.
August	46.0	17.0	22.2	.220	.25	1,365	A.
September	37.0	19.5	25.2	.250	.28	1,500	A.
October	71.0	21.0	31.0	.307	.35	1,906	B.
November	47.0	21.0	27.6	.273	.30	1,642	B.
December	23.0	14.1	17.5	.173	.20	1,076	B.
The year	278	8.9	32.0	.308	4.16	23,128	

[a] During January, February, March, and April the records are from the station about 2 miles below the present station, and the drainage area used is 109 square miles.

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BATTLE CREEK[1] NEAR CHINOOK, MONT.

Location.—In sec. 3, T. 33 N., R. 19 E., at a point about 4½ miles north of Chinook, Mont., about 7 miles above the junction with the main stream.

Records available.—April 22, 1905, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Chain on the left bank near the house of the observer.

Control.—Sandy and shifting.

Discharge measurements.—Made by wading or at the cable near the gage.

Winter flow.—Ice present.

Diversions.—Three canals, which divert in the aggregate about 20 second-feet, take out above the station; several small pumping plants, which supply water for irrigating the bottom land along the valley, also operate above the station. Below the station the Matheson and Cook canals divert water for irrigating land in Milk River valley near the mouth of Battle Creek. The aggregate appropriation for these canals is 78 second-feet. A number of diversions are made from this stream in Canada.

Accuracy.—Results may be considered reliable as a fair rating curve has been constructed. The greater part of the run-off occurs during floods caused by heavy rains in the spring and early summer. In the fall the channel is often dry.

Discharge measurements of Battle Creek near Chinook, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 20	R. R. Randell	[a] 1.30	6.4	June 27	J. B. Stewart	1.00	42
Apr. 21	J. B. Stewart	2.05	173	July 11	do	1.05	36
May 3	do	1.40	83	24	do	.45	4.4
20	do	1.32	78	Aug. 5	do	.42	4.3
June 4	do	.85	28	11	do	.35	2.8
17	do	.50	6.1				

[a] Ice present.

[1] Decision of United States Geographic Board; formerly known as North Fork of Milk River.

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Daily gage height, in feet, of Battle Creek near Chinook, Mont., for 1913.

[Mrs. R. B. Snedecor, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	7.4	1.46	0.98	1.51	0.50	0.19	0.20	0.48	0.70
2	.....	5.8	1.42	.94	1.45	.49	.18	.20	.48	.....
3	.....	4.0	1.40	.94	1.25	.46	.18	.18	.48	.....
4	.....	2.20	1.38	.90	1.16	.44	.18	.20	.49	.....
5	.....	1.82	1.35	.84	3.70	.42	.18	.20	.52	.....
6	.....	1.58	1.32	.80	2.70	.40	.15	.22	.56	.....
7	.....	1.38	1.28	.72	1.60	.39	.....	.24	.62	.....
8	.....	1.26	1.26	.70	1.34	.38	.....	.26	.61	.....
9	5.0	1.22	1.29	.70	1.28	.40	.....	.45	.62	.....
10	3.6	1.38	1.22	.65	1.18	.40	.....	.46	.65	.....
11	2.60	1.71	1.19	.65	1.08	.38	.....	.48	.66	.....
12	1.42	3.50	1.14	.60	1.01	.36	.....	.50	.69	.....
13	.....	2.8	1.14	.60	.98	.35	.....	.44	.70	.....
14	.....	2.6	1.22	.55	.89	.32	.....	.42	.71	.....
15	.....	2.8	1.26	.55	.86	.31	.....	.42	.71	.....
16	.....	3.5	1.29	.50	.79	.30	.....	.40	.68	.....
17	.....	4.4	1.36	.49	.72	.30	.....	.40	.68	.....
18	.....	3.3	1.40	.46	.66	.30	.....	.40	.70	.....
19	.....	2.6	1.41	.44	.58	.29	.....	.40	.70	.....
20	.....	2.3	1.31	.58	.51	.26	.....	.42	.70	.....
21	.....	2.05	1.28	.45	.49	.19	.....	.46	.68	.....
22	.....	1.95	1.26	.45	.50	.18	.....	.48	.70	.....
23	.....	1.95	1.24	.45	.48	.....	.....	.49	.69	.....
24	.....	1.91	1.22	1.52	.45	.....	.20	.48	.67	.....
25	.....	1.82	1.16	1.38	.62	.....	.23	.46	.69	.....
26	.....	1.72	1.14	1.10	.69	.30	.22	.45	.72	.....
27	.....	1.58	1.12	1.00	.69	.30	.24	.45	.78	.....
28	.....	1.52	1.10	.96	.62	.38	.22	.45	.81	.....
29	.....	1.50	1.06	.95	.52	.36	.22	.44	.82	.....
30	.....	1.48	1.02	1.38	.50	.29	.20	.44	.82	.....
31	6.8	.....	.99	.....	.48	.22	.....	.47	.....	.....

NOTE.—Gage height Mar. 31 affected by ice. Apr. 1, observer notes no ice in the river or along the banks.

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Daily discharge, in second-feet, of Battle Creek near Chinook, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	10	2,110	92	40	98	6.1	0.7	0.8	5.6	16
2	10	1,420	87	36	91	5.9	.6	.8	5.6	.....
3	10	700	85	36	68	5.1	.6	.6	5.6	.....
4	10	198	83	32	59	4.7	.6	.8	5.9	.....
5	10	139	80	27	596	4.2	.6	.8	6.9	.....
6	50	107	76	28	206	3.7	.4	1.0	8.4	.....
7	100	83	72	17	102	3.5	.....	1.3	11	.....
8	500	70	70	16	70	3.4	.....	1.5	11	.....
9	1,080	65	73	16	62	3.7	.....	4.9	11	.....
10	570	83	65	13	50	3.7	.....	5.1	13	.....
11	282	123	62	13	39	3.4	.....	5.6	13	.....
12	87	538	56	10	33	3.0	.....	6.1	15	.....
13	50	332	56	10	31	2.8	.....	4.7	16	.....
14	30	282	65	8.0	24	2.3	.....	4.2	16	.....
15	20	332	70	8.0	22	2.2	.....	4.2	16	.....
16	10	538	73	6.1	18	2.0	.....	3.7	14	.....
17	10	840	81	5.9	14	2.0	.....	3.7	14	.....
18	6	478	85	5.1	11	2.0	.....	3.7	16	.....
19	6	282	86	4.7	7.7	1.9	.....	3.7	16	.....
20	6	216	75	9.2	5.6	1.5	.....	4.2	16	.....
21	6	173	72	4.9	5.1	.7	.....	5.1	14	.....
22	6	158	70	4.9	5.6	.6	.....	5.6	16	.....
23	6	158	67	4.9	5.4	.4	.....	5.9	15	.....
24	6	152	65	99	4.7	.4	.8	5.6	14	.....
25	6	139	59	83	11	.4	1.2	5.1	15	.....
26	6	125	56	52	15	2.0	1.0	4.9	17	.....
27	6	107	54	42	15	2.0	1.3	4.9	22	.....
28	50	99	52	38	11	3.4	1.0	4.9	24	.....
29	100	97	48	37	6.9	3.0	1.0	4.7	25	.....
30	500	95	44	83	6.1	1.9	.8	4.7	26	.....
31	1,000	.....	41	.....	5.6	1.0	.....	5.4	.....	.....

NOTE.—Discharge determined from a rating curve fairly well defined between 0.8 second-foot and 200 second-feet. Discharge estimated Mar. 1–8, 13–19, 21–31, and Aug. 23–25. Sept. 7–23, flow estimated at zero.

Monthly discharge of Battle Creek near Chinook, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March	1,080	6	147	9,040	D.
April	2,110	65	341	20,300	C.
May	92	41	68.4	4,210	B.
June	99	4.7	26.2	1,560	B.
July	596	4.7	57.7	3,550	C.
August	6.1	.4	2.67	164	B.
September	1.3	0	.35	21	C.
October	6.1	.6	3.81	234	B.
November	25	5.6	14.1	839	B.
The period	.....	.....	.....	39,900	

ROCK CREEK NEAR HINSDALE, MONT.

Location.—In sec. 10, T. 31 N., R. 36 E., at Ottenstror's ranch, about 2 miles below the headgates of Rock Creek canal and 6 miles northeast of Hinsdale.

Records available.—April 19, 1912, to December 31, 1913. From July 5, 1905, to December 31, 1907, data were obtained at a station 2 miles upstream, just below the diversion dam of the Rock Creek canal. The flow at these two points is practically the same.

Drainage area.—Not measured.

Gage.—Overhanging chain gage on the left bank.

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Control.—Shifts slightly at high water.

Discharge measurements.—Made by wading one-fourth mile below the gage at low and medium stages and from a bridge 2 miles below at high stages.

Winter flow.—Affected by ice.

Diversions.—There is no storage, but the normal summer flow is appropriated and used during the irrigation season.

Accuracy.—Conditions for obtaining accurate discharge data good.

Discharge measurements of Rock Creek near Hinsdale, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 24	R. R. Randell	a6.09	16.0	May 23	J. B. Stewart	5.65	4.5
Apr. 17	J. B. Stewart	6.25	51	June 19	do	6.25	44
May 6	do	5.40	0.85	Aug. 1	do	5.85	12.6

a Ice present.

Daily gage height, in feet, of Rock Creek near Hinsdale, Mont., for 1913.

[Mrs. John Ottenstror, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	12.1	5.3	5.4	6.6	5.85	5.6	5.75
2	.....	10.1	5.3	5.4	7.1	5.85	5.05	5.75
3	.....	9.4	5.35	5.45	7.05	5.85	5.05	5.8
4	.....	8.0	5.3	5.5	6.9	5.8	5.05	5.9
5	.....	7.7	5.35	5.55	7.4	5.75	5.05	5.9
6	.....	7.4	5.4	5.5	7.4	5.7	5.05	5.95
7	.....	6.8	5.4	5.5	7.4	5.7	5.05	5.9
8	.....	6.85	5.4	5.55	6.9	5.7	5.5	5.8
9	.....	6.8	5.4	5.55	6.2	5.7	5.5	5.8
10	.....	6.75	5.4	5.55	6.4	5.7	5.5	5.8
11	.....	6.6	5.4	5.55	6.3	5.7	5.5	5.8
12	.....	6.5	5.65	5.55	6.2	5.7	5.5	5.8
13	.....	6.45	5.4	5.55	6.25	5.7	5.5	5.8
14	.....	6.5	5.4	5.55	6.15	5.7	5.6	5.8
15	.....	6.45	5.45	5.55	6.05	5.7	5.6	5.8
16	.....	6.5	5.5	5.55	6.05	.....	5.6	5.8
17	.....	6.1	5.9	5.6	6.05	6.0	5.6	5.9
18	.....	5.9	5.55	5.6	6.06	5.95	5.6	5.9
19	.....	5.65	5.5	6.25	5.95	5.8	5.6	5.9
20	.....	5.5	5.45	6.25	.....	5.75	5.6	5.9
21	.....	5.35	5.75	6.05	5.85	5.75	5.6	5.9
22	.....	5.4	5.6	6.60	5.9	5.7	5.6	5.9
23	.....	5.3	5.65	6.85	5.95	5.8	5.6	5.85
24	.....	5.3	5.6	6.75	5.95	5.8	5.6	5.85
25	.....	5.3	5.45	6.4	5.95	5.75	5.6	5.9
26	.....	5.35	5.45	6.15	5.9	5.7	5.6	5.95
27	.....	5.3	5.45	6.15	7.5	5.7	5.6	5.95
28	.....	5.3	5.45	6.15	6.3	5.7	5.6	5.9
29	.....	5.35	5.45	6.35	6.05	5.65	5.75	.....
30	.....	5.3	5.45	6.2	5.95	5.65	5.75	.....
31	14.5	.....	5.45	.....	5.85	5.6	.....	.....

NOTE.—Gage height Mar. 31 affected by ice. Gage heights Sept. 2-7 probably erroneous.

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Daily discharge, in second-feet, of Rock Creek near Hinsdale, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	2,200	0	1.0	87	12	3.0	8.0
2	1,220	0	1.0	180	12	2.0	8.0
3	935	.5	1.5	169	12	2.0	10
4	410	0	2.0	138	10	2.0	15
5	335	.5	2.5	246	8.0	2.0	15
6	262	1.0	2.0	246	6.0	2.0	18
7	136	1.0	2.0	246	6.0	2.0	15
8	146	1.0	2.5	138	6.0	2.0	10
9	136	1.0	2.5	38	6.0	2.0	10
10	127	1.0	2.5	60	6.0	2.0	10
11	100	1.0	2.5	48	6.0	2.0	10
12	84	4.5	2.5	38	6.0	2.0	10
13	76	1.0	2.5	43	6.0	2.0	10
14	84	1.0	2.5	34	6.0	3.0	10
15	76	1.5	2.5	26	6.0	3.0	10
16	84	2.0	2.5	26	14	3.0	10
17	35	15	3.0	26	22	3.0	15
18	18	2.5	3.0	26	18	3.0	15
19	4.5	2.0	43	18	10	3.0	15
20	2.0	1.5	43	15	8.0	3.0	15
21	0.5	8.0	26	12	8.0	3.0	15
22	1.0	3.0	87	15	6.0	3.0	15
23	0	4.5	129	18	10	3.0	12
24	0	3.0	112	18	10	3.0	12
25	0	1.5	60	18	8.0	3.0	15
26	.5	1.5	34	15	6.0	3.0	18
27	0	1.5	34	268	6.0	3.0	18
28	0	1.5	34	48	6.0	3.0	15
29	.5	1.5	54	26	4.5	8.0	15
30	0	1.5	38	18	4.5	8.0	15
31	.....	1.5	.....	12	3.0	.....	15

NOTE.—Discharge determined from two rating curves fairly well defined between 3 and 85 second-feet and applicable through May 5 and after May 5, respectively. Discharge estimated Sept. 2–7, because of probable errors in gage heights. Discharge interpolated for days for which gage heights are missing.

Monthly discharge of Rock Creek near Hinsdale, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	2,220	0	216	12,900	B.
May	15	0	2.16	133	C.
June	129	1.0	24.5	1,460	B.
July	268	12	74.7	4,590	B.
August	22	3.0	8.32	512	B.
September	8	2.0	2.93	174	C.
October	18	8	13.0	799	B.
The period	.....	.....	.....	20,600	

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PORCUPINE CREEK AT NASHUA, MONT.

Location.—In the center of the NW. ¼ sec. 25, T. 28 N., R. 40 E., at the road crossing at Nashua, Mont.

Records available.—July 11, 1908, to December 31, 1913.

Drainage area.—Not measured

Gage.—Staff nailed to tree on left bank.

Control.—Channel dry in late summer and in winter.

Discharge measurements.—Made by wading near gage or at high stages from a bridge one-fourth mile below.

Diversions and storage.—The water of this stream is neither diverted nor stored.

Discharge measurements of Porcupine Creek at Nashua, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 16	J. B. Stewart.....	3.98	24.5	June 21	J. B. Stewart.....	3.35	4.0
May 11	.....do.....	3.57	9.6	July 16	.....do.....	3.08	.7
26	.....do.....	3.96	21.5				

Daily gage height, in feet, of Porcupine Creek at Nashua, Mont., for 1913.

[Mrs. R. L. Brocksmith, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	15.1	3.7	3.65	3.25	2.9	2.7
2	.....	11.1	3.7	3.65	3.25	2.95	2.7
3	.....	11.5	3.7	3.55	3.2	2.95	.....
4	.....	9.5	3.6	3.55	3.2	2.8	.....
5	.....	5.8	3.6	3.5	3.2	2.8	.....
6	.....	5.5	3.6	3.5	3.15	2.85	.....
7	.....	5.2	3.5	3.45	3.15	2.85	.....
8	.....	5.1	3.5	3.45	3.15	2.85	.....
9	.....	4.7	3.5	3.4	3.15	2.85	.....
10	.....	4.5	3.5	3.35	3.15	2.9	.....
11	.....	4.4	3.5	3.35	3.1	2.9	.....
12	.....	4.3	3.65	3.3	3.1	2.9	.....
13	.....	4.2	3.6	3.3	3.1	2.9	.....
14	.....	4.2	3.7	3.3	3.1	2.85	.....
15	.....	4.1	3.85	3.3	3.1	2.85	.....
16	.....	4.0	3.95	3.3	3.1	2.85	.....
17	.....	3.9	4.05	3.3	3.1	2.7	.....
18	.....	3.9	4.1	3.3	3.05	2.65	.....
19	.....	3.9	4.2	3.25	3.05	2.65	.....
20	.....	3.9	4.45	3.3	3.05	2.6	.....
21	.....	3.8	4.4	3.3	3.05	2.55	.....
22	.....	3.8	4.3	3.35	3.05	2.55	.....
23	.....	3.8	4.2	3.3	3.06	2.55	.....
24	.....	3.7	4.1	3.3	3.05	2.55	.....
25	.....	3.7	4.05	3.25	3.06	2.5	.....
26	.....	3.7	3.95	3.25	3.05	2.5	.....
27	.....	3.7	3.9	3.25	3.05	2.5	.....
28	.....	3.7	4.0	3.25	3.06	2.5	.....
29	.....	3.7	3.85	3.25	3.05	2.5	.....
30	7.7	3.7	3.85	3.25	3.05	2.5	.....
31	15.6	.....	3.8	.....	2.95	2.7	.....

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Daily discharge, in second-feet, of Porcupine Creek at Nashua, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.
1	.....	611	14	12	2.5
2	.....	371	14	12	2.5
3	.....	395	14	9.0	1.8
4	.....	275	10	9.0	1.8
5	.....	92	10	7.5	1.8
6	.....	80	10	7.5	1.3
7	.....	68	7.5	6.3	1.3
8	.....	64	7.5	6.3	1.3
9	.....	48	7.5	5.1	1.3
10	.....	42	7.5	4.2	1.3
11	.....	38	7.5	4.2	.8
12	.....	34	12	3.2	.8
13	.....	31	10	3.2	.8
14	.....	31	14	3.2	.8
15	.....	28	19	3.2	.8
16	.....	24	22	3.2	.8
17	.....	20	26	3.2	.8
18	.....	20	28	3.2	.5
19	.....	20	31	2.5	.5
20	.....	20	40	3.2	.5
21	.....	17	38	3.2	.5
22	.....	17	34	4.2	.5
23	.....	17	31	3.2	.5
24	.....	14	28	3.2	.5
25	.....	14	26	2.5	.5
26	.....	14	22	2.5	.5
27	.....	14	20	2.5	.5
28	.....	14	24	2.5	.5
29	.....	14	19	2.5	.5
30	180	14	19	2.5	.5
31	641	.....	17	.....	.1

NOTE.—Discharge determined from a fairly well-defined rating curve. Discharge for August was practically zero.

Monthly discharge of Porcupine Creek at Nashua, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 30–31	641	180	410	1,630	B.
April	611	14	82.0	4,880	B.
May	40	7.5	19.0	1,170	B.
June	12	2.5	4.67	278	B.
July	2.5	.1	.94	58	B.
The period	.....	.....	.....	8,020	

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PRIVATE CANALS IN MILK RIVER VALLEY.

GENERAL FEATURES.

Since 1905 a number of stations have been maintained on private canals in Milk River valley for the purpose of ascertaining the extent of private water rights. With the exception of Rock Creek canal, which is near Hinsdale, in Valley County, these canals are situated in Hill and Blaine counties and are used to irrigate lands in the vivinity of Harlem and Chinook.

The canals are all built on small grades and in soil which is easily eroded. In many of them silt has been deposited, and nearly all of them contain a growth of weeds and moss. At low stages the water is uniformly sluggish. In order to divert water into the laterals checks are erected in the main canals, and these checks often produce backwater effects for long distances above. They are put up under a great variety of conditions, and as a result velocities are found to differ widely at the same gage height during the season. In order to establish the correct relation between gage height and discharge it is necessary to make several rating curves for the same canal station. Frequent discharge measurements are necessary to obtain reliable results. Staff gages are located on all canals and most measurements are made by wading.

PARADISE VALLEY CANAL NEAR CHINOOK, MONT.

Location.—Near the headgate at Rudolph Friede's ranch; reached by driving along the south river road from Chinook.

Records available.—June, 1903, to December 31, 1913.

Discharge measurements.—Made by wading.

Discharge measurements of Paradise Valley canal near Chinook, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 16	J. B. Stewart	2.10	11.2	July 25	J. B. Stewart	1.77	4.8
28	do	2.10	9.7	Aug. 4	do	1.95	5.8
July 11	do	1.90	6.1	11	do	1.90	7.8

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Daily gage height, in feet, and discharge, in second-feet, of Paradise Valley canal near Chinook, Mont., for 1913.

[Rudolph Friede, observer.]

Day.	April.		May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	.....	.....	1.32	1.8	1.90	6.0	2.01	7.4	0.4	.....
2	.....	.....	.....	.....	1.41	2.4	1.89	5.9	1.98	6.6	.3	.....
3	.....	.....	.....	.....	1.39	2.2	2.00	8.0	1.98	6.4	.....	.....
4	.....	.....	.....	.....	1.10	.9	1.98	7.6	1.96	5.9	.....	.....
5	.....	.....	.....	.....	1.5	3.0	2.02	8.4	1.95	6.0	.....	.....
6	0.35	.....	.....	.....	1.9	7.0	1.94	6.8	1.93	6.2	.....	.....
7	.32	.....	.....	.....	2.1	11.0	1.92	6.4	1.90	6.0	.....	.....
8	.62	.....	.....	.....	2.0	9.0	1.97	7.4	1.94	7.4	.....	.....
9	.63	.....	.....	.....	2.0	9.0	1.80	5.0	1.90	7.0	.....	.....
10	.53	.....	.....	.....	1.90	7.0	2.01	8.2	1.9	7.4	.....	.....
11	.51	.....	.....	.....	2.02	9.4	1.94	6.8	1.90	7.8	.....	.....
12	.48	.....	.....	.....	1.95	8.0	1.88	5.8	1.99	9.6	.....	.....
13	.63	.....	.....	.....	2.23	14	1.91	6.2	1.92	8.2	.....	.....
14	.70	.....	.....	.....	2.18	13	1.71	4.2	1.93	8.6	.....	.....
15	.64	.....	.....	.....	2.18	13	1.79	4.9	1.91	8.2	.....	.....
16	.62	.....	0.30	0.1	2.05	10	1.79	4.9	1.90	8.0	.....	.....
17	.50	.....	.29	.1	2.10	11	1.64	3.6	1.91	8.2	.....	.....
18	.32	.....	.29	.1	1.94	7.8	1.14	.9	2.04	11	.....	.....
19	.10	.....	1.55	3.3	2.04	10	1.20	1.2	2.18	14	.....	.....
20	.01	.....	1.50	3.0	2.08	10	1.89	5.9	2.28	16	.....	.....
21	.....	.....	1.39	2.2	2.18	12	1.86	5.6	1.94	8.8	.....	.....
22	.....	.....	.55	.....	2.09	10	1.93	6.6	2.00	10	.....	.....
23	.....	.....	.4	.....	2.10	10	1.90	6.0	1.97	9.4	.....	.....
24	.....	.....	.4	.....	2.21	13	1.80	5.0	1.93	8.6	.....	.....
25	.....	.....	.55	.....	2.18	12	1.74	4.5	1.87	7.4	.....	.....
26	.....	.....	.35	.....	2.14	11	1.80	5.0	1.08	1.0	.....	.....
27	.....	.....	.31	.....	2.05	9.2	1.79	4.9	.92	.4	.32	.....
28	.....	.....	.31	.....	2.08	10	1.72	4.3	.98	.6	.32	.....
29	.....	.....	.31	.....	2.60	24	2.00	7.8	.84	.2	.44	.....
30	.....	.....	.31	.....	2.17	11	2.05	8.6	.72	.0	.31	.....
31	.....	.....	.64	.....	.....	.....	2.02	7.8	.66	.0	.....	.....

NOTE.—Discharge determined as follows: Previous to June 28, by indirect method for shifting channels; June 28 to July 28, from a rating curve fairly well defined between 4 and 12 second-feet, and poorly defined at other stages; after July 28 by indirect method for shifting channels. From Apr. 6 to May 15 the headgates were closed, but a small quantity of water was leaking through the headgates; this was estimated for the period Apr. 6–20 at 0.1 second-foot. From May 16–31, the flow came from waste water from the Cook canal for the periods May 16–18 and May 22–31 this was estimated at 0.1 second-foot. The canal headgates were opened May 31, at 1 p. m., and were closed Aug. 25. A very little water leaked through the headgates after this date.

Monthly discharge of Paradise Valley canal near Chinook, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 6–20	.....	.....	0.1	3	D.
May 16–31	3.3	.....	.61	19	D
June	24	0.9	9.39	559	C.
July	8.6	.9	5.81	357	B.
August	16	.....	6.85	421	C.
The season	.....	.....	.....	1,360	

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COOK CANAL NEAR CHINOOK, MONT.

Location.—About half a mile above a small wooden highway bridge on the road running parallel to the Great Northern Railway, about 3 miles east of Chinook.
Records available.—April 10, 1905, to December 31, 1913.
Gage.—Staff.
Discharge measurements.—Made from highway bridge.

Discharge measurements of Cook canal near Chinook, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
May 2	J. B. Stewart	2.70	15.0	June 28	J. B. Stewart	2.70	12.4
15	do	3.18	25	July 11	do	3.03	16.6
20	do	3.20	25	25	do	1.40	1.1
June 4	do	2.92	17.2	Aug. 5	do	1.50	a.5
16	do	2.20	6.5	11	do	1.32	a.3

a Discharge estimated.

Daily gage height, in feet, and discharge, in second-feet, of Cook canal near Chinook, Mont., for 1913.

[Adam Jamison, observer.]

Day.	April.		May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	2.75	16	3.0	20	2.8	15	1.52	0.5	1.30	0.3
2	.....	.....	2.77	17	3.0	20	2.4	8.7	1.52	.5	1.23	.2
3	.....	.....	2.78	17	2.9	17	1.9	3.9	1.55	.6	.....	.....
4	.....	.....	2.80	17	2.9	17	2.1	5.4	1.48	.5	.....	.....
5	.....	.....	2.9	19	2.80	15	3.5	34	1.50	.5	.....	.....
6	.....	.....	3.0	21	2.62	12	2.25	5.8	1.70	1.0	.....	.....
7	.....	.....	3.05	22	2.48	9.7	1.9	3.2	1.72	1.1	.....	.....
8	.....	.....	3.1	24	2.40	8.7	1.2	.5	1.65	.8	.....	.....
9	.....	.....	3.1	24	2.35	8.1	3.2	21	1.6	.7	.....	.....
10	.....	.....	3.05	22	2.39	8.6	3.1	18	1.55	.6	.....	.....
11	.....	.....	3.05	22	2.55	11	3.1	18	1.3	.3	.....	.....
12	.....	.....	3.3	30	2.4	8.7	2.95	15	1.25	.2	.....	.....
13	.....	.....	3.3	30	2.4	8.7	2.9	14	1.15	.2	.....	.....
14	.....	.....	3.3	29	2.30	7.5	2.40	7.2	1.05	.1	.....	.....
15	.....	.....	3.15	24	2.31	7.6	2.69	11	1.0	0	.....	.....
16	.....	.....	3.2	25	2.21	6.5	2.65	10	1.0	0	.....	.....
17	.....	.....	3.2	25	2.00	4.6	2.50	8.3	.9	0	.....	.....
18	.....	.....	3.2	25	1.9	3.9	2.34	6.6	.80	0	.....	.....
19	.....	.....	3.25	27	1.8	3.3	2.15	4.9	.82	0	.....	.....
20	.....	.....	3.2	25	2.0	4.6	1.7	2.3	1.05	.1	.....	.....
21	.....	.....	3.15	24	2.2	6.4	1.70	2.3	1.25	.2	.....	.....
22	.....	.....	3.15	24	2.0	4.6	1.72	2.4	1.5	.5	.....	.....
23	.....	.....	3.15	24	1.75	3.0	1.60	1.9	1.7	1.0	.....	.....
24	.....	.....	3.1	22	1.65	2.6	1.5	1.5	1.75	1.2	.....	.....
25	.....	.....	3.1	22	3.5	38	1.4	1.1	1.50	.5	.....	.....
26	2.18	7.3	3.05	21	2.45	9.4	1.90	3.0	1.43	.4	.....	.....
27	2.15	7.0	3.05	21	2.85	16	1.89	2.7	1.28	.3	.....	.....
28	2.15	7.0	3.05	21	2.7	13	2.00	3.0	1.05	.1	.....	.....
29	2.63	14	3.1	22	3.0	20	1.70	1.5	.85	0	.....	.....
30	2.80	17	3.1	22	3.2	25	1.62	1.0	.....	0	.....	.....
31	.....	.....	3.05	21	.....	.....	1.52	.6	.....	0	.....	.....

NOTE.—Discharge determined as follows: Previous to May 15, by indirect method for shifting channels; May 15 to July 4, from a fairly well-defined rating curve; July 5, by indirect method for shifting channels; July 6–25, from a poorly defined rating curve; July 26–30, by indirect method for shifting channels; July 31 to Sept. 2, from a poorly defined rating curve. The headgate of the canal was opened Apr. 25, and there was practically no flow after Aug. 14.

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Monthly discharge of Cook canal near Chinook, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 26-30	17	7.0	10.5	104	C.
May	30	16	22.7	1,400	C.
June	38	2.6	10.2	607	B.
July	34	0.5	7.54	464	C.
August	1.2	0	.38	23	C.
The season				2,598	

MATHESON CANAL NEAR CHINOOK, MONT.

Location.—At a footbridge 200 feet below the headgate of the canal, near the main road, 3½ miles east of Chinook.

Records available.—April 10, 1905, to December 31, 1913.

Gage.—Staff.

Discharge measurements.—Made from footbridge or by wading.

Discharge measurements of Matheson canal near Chinook, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 26	J. B. Stewart	3.63	8.0	July 11	J. B. Stewart	3.45	1.9
May 2	do	3.50	7.0	25	do	3.50	1.2
20	do	3.48	4.3	Aug. 5	do	3.52	e.3
June 16	do	3.28	2.2	11	do	3.45	e.1
28	do	3.90	3.8				

e Discharge estimated.

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Daily gage height, in feet, and discharge, in second-feet, of Matheson canal near Chinook, Mont., for 1913.

[Adam Jamison, observer.]

Day.	April.		May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			3.6	7.8	2.8	0.5	4.2	6.2	3.4	0.2	2.4	
2			3.5	7.0	2.75	.4	4.1	5.5	3.4	.2	2.4	
3			3.45	6.4	2.8	.5	3.95	4.5	3.4	.1		
4			3.25	4.8	2.6	0	4.0	4.9	3.5	.3		
5			3.15	3.9	3.1	1.6	4.9	13.1	3.5	.3		
6			3.2	4.1	3.5	3.9	4.4	8.4	3.45	.2		
7			3.3	4.7	3.5	3.8	4.1	5.9	3.35	0		
8			3.2	3.9	3.5	3.7	3.9	4.5	3.3			
9			3.15	3.4	3.5	3.7	3.5	2.1	3.3			
10			3.2	3.6	3.45	3.4	3.5	2.1	3.3			
11			3.2	3.4	3.2	1.9	3.5	2.2	3.4			
12			3.2	3.3	3.55	3.9	3.4	1.6	3.4			
13			3.25	3.5	3.6	4.3	3.35	1.3	3.4			
14			3.3	3.7	3.5	3.6	3.3	1.0	3.4			
15			3.4	4.3	3.3	2.4	3.25	.8	3.35			
16			3.4	4.1	3.25	2.0	3.2	.6	3.15			
17			3.4	4.0	3.25	1.8	3.2	.5	3.1			
18			3.45	4.2	3.2	1.5	3.25	.6	3.0			
19			3.45	4.1	3.2	1.3	3.25	.6	3.00			
20			3.5	4.3	3.4	2.2	3.45	1.2	2.98			
21			3.4	3.7	3.5	2.6	3.0	0	2.95			
22			3.4	3.7	3.65	3.3	3.5	1.3	2.93			
23			3.4	3.7	3.75	3.7	3.4	.9	2.90			
24			3.4	3.6	3.75	3.6	3.5	1.3	2.85			
25			3.45	3.9	4.1	5.8	3.5	1.2	2.75			
26	3.5	7.0	3.5	4.2	4.0	4.8	3.55	1.3	2.79			
27	3.55	7.4	3.4	3.6	3.9	3.9	3.5	.9	2.72			
28	3.6	7.8	3.25	2.6	3.9	3.8	3.65	1.4	2.63			
29	3.6	7.8	3.00	1.3	4.1	5.3	3.45	.6	2.58			
30	3.6	7.8	2.93	1.0	4.2	6.2	3.5	.6	2.45			
31			2.85	.7			3.4	.3	2.42			

NOTE.—Discharge determined as follows: Apr. 4–25, estimated at 8 second-feet; Apr. 26 to May 2, from a fairly well defined rating curve; after May 2, by indirect method for shifting channels. The headgates of the canal were opened Apr. 3 and the flow remained practically constant to Apr. 26, when gage observations were begun. No water was running in the canal from Aug. 7 to Sept. 2, but it was standing in pools.

Monthly discharge of Matheson canal near Chinook, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 4–30			7.92	424	B.
May	7.8	0.7	3.89	239	C.
June	6.2	.0	2.98	177	C.
July	13.1	.0	2.50	154	C.
August	.3	.0	0.22	3	C.
The season				997	

HARLEM CANAL NEAR ZURICH, MONT.

Location.—About 500 feet below the headgates of the canal, 1½ miles southeast of the Great Northern Railway section house at Zurich; reached by driving from Chinook.

Records available.—June, 1903, to December 31, 1913.

Gage.—Staff.

Discharge measurements.—Made by wading.

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Discharge measurements of Harlem canal near Zurich, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 25	J. B. Stewart	2.48	30	June 16	J. B. Stewart	3.68	85
May 16	do	3.02	41	July 3	do	3.00	6.7
30	do	3.40	41				

Daily gage height, in feet, and discharge, in second-feet, of Harlem canal near Zurich, Mont., for 1913.

[Howsan Kirby, observer.]

Day.	Apr.		May.		June.		July.		Aug.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			2.34	27	3.57	44	3.11	10	1.70	
2			2.38	28	3.66	45	2.98	6.7	1.15	
3			2.59	32	3.74	46	2.98	6.7		
4			2.52	30	3.64	42	2.96	6.4		
5			2.47	29	3.50	39	2.84	4.9		
6			2.48	30	3.48	37	2.65	3.0		
7			2.34	27	3.54	38	2.48	1.9		
8			2.34	27	3.49	36	2.32	1.1		
9			2.64	33	3.57	38	2.51	2.0		
10			2.86	38	3.58	37	3.10	8.5		
11			2.91	39	3.70	38	3.08	8.2		
12			3.03	42	3.67	38	2.86	5.1		
13			3.09	43	3.74	38	3.93	25		
14			3.30	48	3.78	38	4.12	28		
15			3.53	54	3.77	38	3.83	23		
16			3.05	42	3.66	35	3.72	20		
17			3.06	43	3.66	34	3.83	23		
18			3.02	42	3.59	32	3.89	24		
19			3.16	44	3.46	28	3.71	20		
20	2.08	22	3.28	47	3.68	31	3.37	13		
21	1.99	20	3.16	42	3.79	33	3.25	11		
22	1.98	20	3.41	48	3.84	33	3.30	12		
23	2.09	22	3.38	47	3.71	29	3.55	17		
24	2.10	22	3.36	45	3.70	28	3.25	11		
25	2.26	25	3.34	43	3.60	25	3.18	9.7		
26	2.47	29	3.36	44	3.40	20	3.08	8.2		
27	2.46	29	3.36	42	3.28	17	2.85	5.0		
28	2.36	27	3.36	41	3.16	13	2.80	4.5		
29	2.36	27	3.40	42	2.76	6	2.68	3.3		
30	2.41	28	3.46	41	2.38	2	2.39	1.5		
31			3.52	42			2.00	0.5		

NOTE.—Discharge determined as follows: Apr. 20 to May 18, from a poorly defined rating curve; May 19 to July 1, by indirect method for shifting channels; July 2 to 31, from a poorly defined rating curve. The head gates were opened Apr. 20 and closed Aug. 2.

Monthly discharge of Harlem canal near Zurich, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 20-30	29	20	24.6	537	C.
May	54	27	39.4	2,420	C.
June	46	2	31.9	1,900	C.
July	28	.5	10.5	646	C.
The season				5,500	

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AGENCY DITCH NEAR HARLEM, MONT.

Location.—At the highway bridge about one-fourth mile below the headgate of the ditch; reached by driving southward from Harlem, Mont.

Records available.—July 14, 1905, to December 31, 1913.

Gage.—Staff.

Discharge measurements.—Made by wading.

Discharge measurements of Agency ditch near Harlem, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
May 29	J. B. Stewart	4.60	87	June 23	Lee Teter	4.35	73
June 1	do	4.50	76	26	do	4.50	57
2	Lee Teter	4.55	78	30	J. B. Stewart	4.83	65
6	do	4.50	70	July 1	Lee Teter	3.78	87
10	do	4.35	60	9	do	3.35	69
15	C. R. Hauke	4.30	58	25	do	2.00	26
18	J. B. Stewart	4.15	58				

Daily gage height, in feet, and discharge, in second-feet, of Agency ditch near Harlem, Mont., for 1913.

[L. W. Teter, observer.]

Day.	May.		June.		July.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1			4.5	76	3.8	87
2			4.6	78	3.1	60
3				77	3.0	56
4			4.6	76	3.2	64
5				73	3.3	67
6			4.5	70	3.8	87
7				70	3.4	71
8				70	3.0	56
9				60	3.0	56
10			4.4	60	2.0	26
11			4.3	55	1.25	11
12				54		
13			4.2	54		
14				56		
15			4.3	58		
16			4.3	58		
17			4.2	58		
18			4.2	58		
19			4.2	62		
20			4.2	66		
21			4.4	70		
22			4.6	80		
23			4.4	73		
24			4.3	67		
25			4.2	62	1.90	24
26			4.1	51	2.00	26
27	4.6	87	4.1	57	2.05	27
28	4.6	87	2.05	30	2.05	27
29	4.6	87		30		
30	4.6	87		65		
31	4.5	76				

NOTE.—Discharge determined as follows: July 1–31, from a fairly well-defined rating curve; May and June, estimated from discharge measurements. Canal dry July 12–24. Headgates opened May 27 and closed for the season July 28. Checks were put in the canal just below the gage and removed at frequent intervals during the irrigating season, causing sudden changes in the relation of gage height to discharge.

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Monthly discharge of Agency ditch near Harlem, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 27–31	87	76	84.8	841	C.
June	80	30	62.7	3,730	C.
July	87	0	24.0	1,480	B.
The season				6,050	

FORT BELKNAP CANAL NEAR CHINOOK, MONT.

Location.—At the highway bridge about 500 feet below the headgates of the canal, 8 miles west of Chinook.

Records available.—June 21, 1903, to December 31, 1913.

Gages.—The high water of June, 1908, washed out both the bridge and the gage; a new gage was installed June 27, 1908, at a different datum within a few feet of the site of the old gage; a new bridge was built about one-fourth mile upstream from the site of the old one.

Discharge measurements.—Made by wading at a section about 300 feet below the gage.

Discharge measurements of Fort Belknap canal near Chinook, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
May 4	J. B. Stewart	1.53	23.6	July 10	J. B. Stewart	1.88	25
17	do	1.68	32	24	do	2.70	42
June 4	do	2.49	58	Aug. 4	do	2.33	14.4
17	do	2.65	61	9	do	2.90	25
27	do	2.50	47				

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Daily gage height, in feet, and discharge, in second-feet, of Fort Belknap canal near Chinook, Mont., for 1913.

[E. O. Walters, observer.]

Day.	April.		May.		June.		July.		August.		September.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	.....	22	2.4	55	2.10	30	2.4	19	2.3	8
2	.....	.....	1.4	20	2.4	54	2.02	27	2.4	18	2.3	8
3	.....	.....	.....	20	2.4	54	1.80	21	2.40	17	2.3	8
4	.....	.....	1.4	20	2.5	58	1.8	21	2.27	13	2.3	8
5	.....	.....	1.5	23	2.5	58	1.3	10	2.70	23	2.3	8
6	.....	.....	1.55	25	2.5	57	1.5	14	2.85	27	2.3	8
7	.....	.....	1.6	26	2.45	54	1.45	13	2.9	28	2.4	10
8	.....	.....	1.75	32	2.5	56	1.55	15	2.90	27	2.35	9
9	.....	.....	1.95	41	2.5	55	1.65	18	2.92	27	2.3	8
10	.....	.....	2.1	50	2.8	75	1.9	26	2.92	26	2.3	8
11	.....	.....	2.0	44	2.85	77	1.9	25	2.95	27	2.2	6
12	.....	.....	2.0	45	2.85	77	2.1	31	2.95	26	2.25	7
13	.....	.....	2.1	51	2.8	73	2.1	30	2.95	26	2.25	7
14	.....	.....	1.9	40	2.8	72	2.1	29	2.97	26	2.2	6
15	.....	.....	1.5	25	2.7	65	2.15	30	2.90	24	2.2	6
16	.....	.....	2.0	46	2.5	52	2.2	31	2.8	21	2.1	4
17	.....	.....	.....	32	2.55	55	2.55	45	2.8	20	1.4	.....
18	.....	.....	1.6	28	2.7	63	2.55	43	2.8	20	.....	.....
19	.....	.....	1.7	31	2.8	70	2.72	51	2.7	17	.....	.....
20	.....	.....	1.7	31	2.6	56	2.72	49	2.95	24	.....	.....
21	.....	.....	1.6	26	2.6	55	2.70	47	2.45	11	.....	.....
22	.....	.....	1.8	34	2.6	55	2.7	45	2.4	10	.....	.....
23	.....	.....	1.7	29	2.55	52	2.7	44	2.35	9	.....	.....
24	.....	.....	1.75	31	2.5	48	2.7	42	2.3	8	.....	.....
25	.....	.....	1.8	32	2.5	48	2.65	38	2.25	7	.....	.....
26	.....	.....	1.8	31	2.55	51	2.65	36	1.5	0	.....	.....
27	2.0	42	1.85	32	2.5	47	2.6	33	1.5	0	.....	.....
28	2.0	42	2.0	37	2.5	47	2.6	31	1.5	0	.....	.....
29	2.0	42	2.05	39	2.55	51	2.55	27	1.5	0	.....	.....
30	1.5	23	2.15	43	2.3	38	2.5	25	2.3	8	.....	.....
31	.....	.....	2.1	40	.....	.....	2.45	22	2.3	8	.....	.....

NOTE.—Discharge determined by the indirect method for shifting channels for the entire season. Headgates were opened Apr. 27 and closed Sept. 17.

Monthly discharge of Fort Belknap canal near Chinook, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 27–30	42	23	37.2	295	C.
May	51	20	33.1	2,040	C.
June	77	38	57.6	3,430	C.
July	51	10	30.6	1,880	C.
August	28	0	16.7	1,030	D.
September 1–17	10	0	7.0	236	D.
The season	.....	.....	.....	8,910	

LITTLE PORCUPINE CREEK BASIN.

LITTLE PORCUPINE CREEK NEAR FRAZER, MONT.

Location.—In the NE. ¼ NE. ¼ sec. 28, T. 27 N., R. 44 E., above the intake of the reservoir about half a mile north of Frazer.

Records available.—July 13, 1908, to Dec. 31, 1913. Records from 1908 to 1910 were obtained at a site 1¾ miles downstream. April 14, 1911, to May 10, 1913, records were obtained one-fourth mile below the present site.

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Drainage area.—Not measured.

Gage.—Staff gage on left bank. Previous to May 10 a staff gage on the left bank about one-fourth mile farther downstream.

Control.—Shifting during high water.

Discharge measurements.—Made by wading.

Diversions.—None.

Accuracy.—Results fair.

Discharge measurements of Little Porcupine Creek near Frazer, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 15	J. B. Stewart	a3.59	7.75	June 20	J. B. Stewart	1.50	54
May 11	do	.44	1.75	21	do	1.88	105
26	do	.77	7.8	21	do	2.00	119
27	do	.72	6.8	25	do	1.02	25.5
June 20	do	1.12	31				

a Measurement on Apr. 15 is referred to old gage. All other measurements are referred to the new gage.

Daily gage height, in feet, and discharge, in second-feet, of Little Porcupine Creek near Frazer, Mont., for 1913.

[William Ivey, observer.]

Day.	April.		May.		June.		July.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	5.3	231	3.41	2.2	0.58	4.6	0.62	6
2	5.2	215	3.06	.1	.52	3.4	.65	6
3	4.9	168	3.06	.1	.50	3.0	.60	5
4	4.5	108	3.06	.1	.50	3.0	.68	7
5	4.2	66	3.21	.3	.48	2.6	.62	6
6	3.86	28	3.44	2.8	.42	1.4	.52	2.4
7	3.68	14	3.48	3.6	.35	.5	.48	2.6
8	3.64	11	3.51	4.4	.30	.0	.42	1.4
9	3.58	7	3.51	4.4	.30	.0	.40	1.0
10	3.48	3.6	3.48	3.6	.30	.0	.40	1.0
11	3.41	2.2	.45	2.0	.25	.0	.32	.2
12	3.38	1.7	.50	3.0	.25	.0	.30	.0
13	3.38	1.7	.50	3.0	.22	.0	.30	.0
14	3.61	9	.60	5	.20	.0	.28	.0
15	3.61	9	.60	5	.20	.0	.22	.0
16	3.51	4.4	.62	6	.20	.0	.20	.0
17	3.26	.5	.72	8	.20	.0	.18	.0
18	3.26	.5	.75	9	.20	.0	.....	.....
19	3.24	.4	.90	16	.15	.0	.....	.....
20	3.18	.3	1.00	21	1.16	31	.....	.....
21	3.21	.3	1.02	22	1.76	86	.....	.....
22	3.16	.2	.98	20	1.90	105	.....	.....
23	3.16	.2	.82	12	1.20	34	.....	.....
24	3.16	.2	.82	12	1.80	91	.....	.....
25	3.16	.2	.80	11	1.00	21	.....	.....
26	3.11	.1	.75	9	.95	18	.....	.....
27	3.08	.1	.70	8	.90	16	.....	.....
28	3.44	2.8	.70	8	.82	12	.....	.....
29	3.51	4.4	.68	7	.75	9	.....	.....
30	3.56	6	.65	6	.70	8	.....	.....
31	.....	.....	.62	6	.....	.....	.....	.....

NOTE.—Gage heights to May 10 at old station and after May 10 at new station.
Discharge to May 10 determined from a poorly defined rating curve, and after May 10 from a rating curve fairly well defined above 1 second-foot. Creek practically dry after July 12.

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Monthly discharge of Little Porcupine Creek near Frazer, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	231	0.1	29.9	1,780	C.
May	22	.1	7.12	438	B.
June	105	.....	15.0	893	B.
July	7	.....	1.28	79	B.
August	.....	.....	Dry.	.....	
September	.....	.....	Dry.	.....	
October	.....	.....	Dry.	.....	
November	.....	.....	Dry.	.....	
December	.....	.....	Dry.	.....	
The period	.....	.....	.....	3,190	

WOLF CREEK BASIN.

WOLF CREEK NEAR WOLF POINT, MONT.

Location.—In the SE. ¼ SW. ¼ sec. 8, T. 27 N., R. 47 E., at William Smith's ranch, 2½ miles northwest of Wolf Point, Mont.

Records available.—August 15, 1908, to December 31, 1913.

Drainage area.—Not measured.

Gage.—A staff near the house of the observer.

Control.—Shifting.

Discharge measurements.—Made by wading near the gage.

Diversions.—A small irrigation ditch diverts water above the gage.

Accuracy.—Results only fair.

Discharge measurements of Wolf Creek near Wolf Point, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 16	J. B. Stewart.....	2.03	5.7	June 22	J. B. Stewart.....	1.82	1.7
May 8	.....do.....	1.88	4.2	July 19	.....do.....	1.55	.1
24	.....do.....	2.19	11.2				

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Daily gage height, in feet, of Wolf Creek near Wolf Point, Mont., for 1913.

[W. H. Smith, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	3.0	1.9	2.0	1.9	1.5	1.5	1.5	1.5
2	.....	3.0	1.9	2.0	1.9	1.5	1.5	1.5	1.5
3	.....	3.0	1.9	2.0	1.9	1.5	1.5	1.5	1.5
4	.....	3.0	1.9	1.8	1.9	1.5	1.5	1.5	1.5
5	.....	3.0	1.9	1.8	1.9	1.5	1.5	1.5	1.5
6	.....	3.0	1.9	1.8	1.9	1.5	1.5	1.5	1.5
7	.....	3.0	1.9	1.8	1.9	1.5	1.5	1.5	1.5
8	.....	2.5	1.85	1.8	1.6	1.5	1.5	1.5	1.5
9	.....	2.5	1.85	1.6	1.6	1.5	1.5	1.5	.....
10	.....	2.3	1.85	1.6	1.6	1.5	1.5	1.5	.....
11	.....	2.3	1.85	1.6	1.6	1.5	1.5	1.5	.....
12	.....	2.0	1.85	1.6	1.6	1.5	1.5	1.5	.....
13	.....	2.0	1.85	1.6	1.6	1.5	1.5	1.5	.....
14	.....	2.0	2.1	1.6	1.6	1.5	1.5	1.5	.....
15	.....	2.0	2.1	1.6	1.5	1.5	1.5	1.5	.....
16	.....	2.0	2.1	1.6	1.5	1.5	1.5	1.5	.....
17	.....	2.0	2.1	1.6	1.6	1.5	1.5	1.5	.....
18	.....	2.0	2.1	1.6	1.6	1.5	1.5	1.5	.....
19	.....	2.0	2.2	1.6	1.6	1.5	1.5	1.5	.....
20	.....	2.0	2.2	1.6	1.5	1.5	1.5	1.5	.....
21	.....	2.0	2.2	1.6	1.5	1.5	1.5	1.5	.....
22	.....	2.0	2.2	1.6	1.5	1.5	1.5	1.5	.....
23	.....	1.9	2.2	1.6	1.5	1.5	1.5	1.5	.....
24	.....	1.9	2.2	2.0	1.5	1.5	1.5	1.5	.....
25	.....	1.9	2.2	2.0	1.5	1.5	1.5	1.5	.....
26	.....	1.9	2.2	2.0	1.5	1.5	1.5	1.5	.....
27	.....	1.9	2.2	2.0	1.5	1.5	1.5	1.5	.....
28	.....	1.9	2.2	2.0	1.5	1.5	1.5	1.5	.....
29	.....	1.9	2.2	1.9	1.5	1.5	1.5	1.5	.....
30	4.0	1.9	2.0	1.9	1.5	1.5	1.5	1.5	.....
31	4.0	.....	2.0	.....	1.5	1.5	.....	1.5	.....

NOTE.—Gage heights Mar. 30–31 distorted by ice.

Daily discharge, in second-feet, of Wolf Creek near Wolf Point, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Day.	Apr.	May.	June.	July.
1	45	4.2	5.8	3.2	16	5.1	8.7	0.1	0.1
2	45	4.2	5.6	3.2	17	5.1	8.7	.1	.1
3	45	4.2	5.6	3.2	18	5.1	8.7	.1	.1
4	45	4.3	2.2	3.4	19	5.3	12	.1	.1
5	45	4.3	2.2	3.4	20	5.3	12	.1	.....
6	45	4.3	2.1	3.4	21	5.3	12	.1	.....
7	45	4.5	2.1	3.5	22	5.4	12	.1	.....
8	20	3.7	2.0	.1	23	3.7	12	.1	.....
9	20	3.7	.1	.1	24	3.7	12	4.5	.....
10	13	3.7	.1	.1	25	3.9	12	4.5	.....
11	13	3.7	.1	.1	26	3.9	11	4.5	.....
12	5.1	3.7	.1	.1	27	3.9	11	4.7	.....
13	5.1	3.7	.1	.1	28	4.0	11	4.7	.....
14	5.1	8.7	.1	.1	29	4.0	11	3.1	.....
15	5.1	8.7	.1	.1	30	4.0	6.0	3.1	.....
					31	.....	5.8	.....	.....

NOTE.—Discharge determined by the indirect method for shifting channels. Discharge estimated June 9–23 and July 8–19. Stream practically dry after July 19. A small ditch, heading just above the gage, diverted about 1 second-foot during May and about 0.8 second-foot June 1–23.

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Monthly discharge of Wolf Creek near Wolf Point, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	45	3.7	15.6	928	C.
May	12	3.7	7.60	467	C.
June	5.8	.1	1.94	115	C.
July	3.5	0	.79	49	D.
August	0	0	0	.....	
September	0	0	0	.....	
October	0	0	0	.....	
November 1–8	0	0	0	.....	
The period	.....	.....	.....	1,560	

POPLAR RIVER BASIN.

POPLAR RIVER NEAR POPLAR, MONT.

Location.—At the United States Reclamation Service camp in NE. ¼ sec. 4, T. 29 N., R. 51 E., 18 miles north of Poplar, and 12 miles upstream from the station formerly maintained at Buerskia's ranch, in the S. ½ sec. 5, T. 28 N., R. 51 E.

Records available.—August 15, 1908, to June 30, 1911, at old site; May 2, 1911, to October 4, 1913, at present site. From October 5 to December 31, 1913, records were obtained at a new United States Reclamation Service camp 5 miles from Poplar.

Drainage area.—Not measured.

Gage.—Overhanging chain gage.

Channel.—Slightly shifting.

Discharge measurements.—Made by wading.

Winter flow.—Affected by ice.

Discharge measurements of Poplar River near Poplar, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 14	J. B. Stewart.....	4.90	246	July 17	J. B. Stewart.....	4.18	45.0
May 9	.....do.....	4.15	66	30	.....do.....	3.80	17.2
24	.....do.....	4.55	131	[a] Nov. 12	W. A. Lamb.....	4.2	41
June 23	.....do.....	4.30	75				

[a] At new United States Reclamation Service camp near Poplar.

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Daily gage height, in feet, of Poplar River near Poplar, Mont., for 1913.

[R. A. Kerin, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	4.25	4.2	4.4	3.8	3.7	3.6	4.10
2	.....	4.25	4.2	4.35	3.85	3.6	3.6	4.08
3	.....	4.2	4.1	4.25	3.85	3.8	3.8	4.08
4	.....	4.2	4.05	4.55	3.85	3.8	3.8	4.05
5	.....	4.2	4.05	4.4	3.8	3.8	3.90	4.10
6	.....	4.2	4.0	4.35	3.8	3.8	4.00	4.10
7	.....	4.2	3.95	4.3	3.85	3.8	4.00	4.15
8	.....	4.15	3.85	4.3	3.85	3.7	4.00	4.20
9	.....	4.15	3.8	4.25	3.85	3.8	4.00	4.20
10	.....	4.5	3.9	4.3	4.0	3.8	4.10	4.20
11	.....	4.3	3.95	4.3	3.95	3.8	4.10	4.15
12	.....	4.25	3.9	4.3	3.9	1.8	4.12	4.20
13	.....	4.2	3.85	4.25	3.9	3.8	4.15	3.85
14	4.90	4.35	3.85	4.25	3.9	3.8	4.18	4.20
15	4.94	4.35	4.25	4.2	3.9	3.8	4.15	4.20
16	4.86	4.4	4.1	4.2	3.85	3.7	4.15	4.20
17	4.82	4.45	4.0	4.18	3.9	3.7	4.15	4.25
18	4.75	4.55	3.95	4.2	3.9	3.7	4.12	4.25
19	4.7	4.6	3.9	4.1	3.9	3.7	4.12	4.25
20	4.65	4.7	3.9	4.1	3.9	3.7	4.10	4.20
21	4.6	4.65	4.0	.....	3.85	3.7	4.10	4.25
22	4.55	4.6	4.0	4.0	3.85	3.7	4.10	4.15
23	4.55	4.55	4.3	3.95	3.85	3.7	4.10	4.25
24	4.45	4.55	4.55	3.95	3.85	3.8	4.10	4.15
25	4.4	4.5	4.6	3.9	3.85	3.8	4.10	4.10
26	4.35	4.45	4.5	3.9	3.8	3.8	4.10	4.20
27	4.32	4.4	4.45	3.9	3.8	3.8	4.10	4.12
28	4.30	4.35	4.55	3.9	3.8	3.8	4.05	4.20
29	4.3	4.3	4.5	3.85	3.8	3.8	4.10	4.20
30	4.25	4.25	4.45	3.85	3.8	3.8	4.10	.....
31	.....	4.25	.....	3.8	3.8	.....	4.10	.....

NOTE.—Station was visted Apr. 14, and it was found that the staff gage had been washed out. A temporary staff gage was put in at a section about 200 feet above the old gage, and this was replaced by a chain gage May 9. The datum is the same as that of the gage used during 1912, but the control and conditions of channel are different. On Oct. 5 the gage was moved to a new United States Reclamation Service camp several miles below the former site, the old camp being abandoned. Gage heights after Oct. 4 read at the new site.

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Daily discharge, in second-feet, of Poplar River near Poplar, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	86	56	93	18	15	12
2	.....	86	56	83	20	12	12
3	.....	77	42	64	20	18	18
4	.....	77	36	129	20	18	18
5	.....	77	36	93	18	18	.....
6	.....	77	31	83	18	18	.....
7	.....	77	27	73	20	18	.....
8	.....	69	20	73	20	15	.....
9	.....	69	18	64	20	18	.....
10	.....	135	23	73	31	18	.....
11	.....	93	27	73	27	18	.....
12	.....	82	23	73	23	18	.....
13	.....	74	20	64	23	18	.....
14	245	99	20	64	23	18	.....
15	258	99	64	56	23	18	.....
16	233	107	42	56	20	15	.....
17	221	117	31	53	23	15	.....
18	201	137	27	56	23	15	.....
19	187	149	23	42	23	15	.....
20	174	171	23	42	23	15	.....
21	161	156	31	36	20	15	.....
22	149	142	31	31	20	15	.....
23	149	129	73	27	20	15	.....
24	126	129	129	27	20	18	.....
25	115	116	142	23	20	18	.....
26	105	104	116	23	18	18	.....
27	99	93	104	23	18	18	.....
28	95	83	129	23	18	18	.....
29	95	73	116	20	18	18	.....
30	86	64	104	20	18	18	.....
31	.....	64	.....	18	18	.....	.....

NOTE.--Discharge determined as follows: To May 9 from a fairly well-defined rating curve; May 10–20, by indirect method for shifting channels; May 20–Oct. 4, from a fairly well-defined rating curve. Discharge interpolated July 21. No rating as yet developed for the new location of the gage.

Monthly discharge of Poplar River near Poplar, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 14–30	258	86	159	5,360	B.
May	171	64	100	6,150	C.
June	142	18	54.0	3,210	B.
July	129	18	54.1	3,330	B.
August	31	18	20.8	1,280	B.
September	18	12	16.8	1,000	B.
The period	.....	.....	.....	20,300	

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BIG MUDDY CREEK BASIN.

BIG MUDDY CREEK NEAR CULBERTSON, MONT.

Location.—In the SW. ¼ sec. 17, T. 29 N., R. 54 E., at Shield's, formerly Sholts's ranch, 11 miles above mouth of stream, 15 miles northwest of Culbertson, and 8 miles above site of original station at Boyd's ranch, which was discontinued because gage heights were affected by backwater from the Missouri.

Records available.—July 14, 1908, to July 19, 1909, at original station; July 19, 1909, to December 31, 1913, at present station.

Gage.—An inclined rod on left bank of stream near residence of observer.

Control.—Mud.

Discharge measurements.—Made by wading.

Winter flow.—Little if any flow during months of January, February, October, November, and December.

Accuracy.—Results at new station good.

Discharge measurements of Big Muddy Creek near Culbertson, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 13	J. B. Stewart	3.49	71	July 18	J. B. Stewart	3.25	5.7
May 7	do	2.45	19.0	29	do	3.10	5.3
25	do	2.80	34	Nov. 11	W. A. Lamb	2.32	10.2
June 24	do	2.25	6.1				

Daily gage height, in feet, of Big Muddy Creek near Culbertson, Mont., for 1913.

[Thomas Shields, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	2.9	2.55	2.62	5.6	2.9	3.45	2.0	2.4
2	3.2	2.5	2.52	5.4	2.85	3.35	2.0	2.35
3	3.4	2.5	2.5	4.9	2.85	3.35	2.0	2.35
4	5.1	2.5	2.5	4.6	2.7	3.35	2.0	2.4
5	5.2	2.45	2.5	4.5	2.69	3.3	2.0	2.45
6	7.0	2.45	2.48	4.4	2.6	3.3	2.1	2.4
7	7.2	2.45	2.45	3.85	.....	3.25	2.1	2.4
8	6.0	2.45	2.4	3.7	2.5	3.2	2.15	2.4
9	4.6	2.45	2.35	3.6	2.5	3.1	2.15	2.35
10	4.35	2.45	2.35	3.55	2.4	2.9	2.2	2.35
11	4.05	2.5	2.35	3.45	2.45	2.7	2.2	2.3
12	3.6	2.5	2.3	3.4	2.4	2.6	2.0	2.3
13	3.5	2.5	2.25	3.4	2.35	2.55	2.0	2.3
14	3.4	2.5	2.25	3.3	2.35	2.4	2.2	2.3
15	3.35	2.55	2.22	3.3	2.3	2.45	2.2	2.3
16	3.4	2.6	2.22	3.28	2.3	2.4	2.3	2.3
17	3.3	2.6	2.22	3.25	2.25	2.4	2.3	2.3
18	3.1	2.65	2.22	3.25	2.22	2.3	2.45	2.3
19	2.95	2.7	2.35	3.25	2.2	2.25	2.45	2.3
20	2.9	2.75	2.5	3.25	2.2	2.25	2.5	2.3
21	2.8	2.8	2.55	3.25	2.2	2.2	2.5	2.3
22	2.75	2.9	2.5	3.25	2.15	2.15	2.5	2.3
23	2.7	2.9	2.4	3.23	2.15	2.1	2.45	.....
24	2.65	2.9	2.25	3.22	2.15	2.10	2.45	.....
25	2.6	2.8	2.35	3.20	2.15	2.05	2.4	.....
26	2.6	2.78	2.5	3.15	2.15	2.0	2.4	.....
27	2.6	2.7	3.6	3.15	2.25	2.0	2.35	.....
28	2.55	2.68	5.8	3.1	2.85	2.0	2.35	.....
29	2.6	2.65	5.8	3.05	3.1	2.0	2.4	.....
30	2.55	2.6	5.6	3.0	3.3	2.0	2.4	.....
31	.....	2.65	.....	2.95	3.35	.....	.....	.....

NOTE.—Gage heights Apr. 1 and 2 may be slightly affected by ice, but are assumed correct.

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Daily discharge, in second-feet, of Big Muddy Creek near Culbertson, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	38	21	24	255	.....	69	2	14
2	55	18	19	230	.....	63	2	12
3	66	18	18	160	.....	63	2	12
4	231	18	18	130	.....	63	2	14
5	243	16	18	115	.....	60	2	16
6	494	16	18	105	.....	60	4	14
7	526	16	16	60	.....	58	4	14
8	347	16	14	50	.....	55	5	14
9	173	16	12	41	.....	50	5	12
10	147	16	12	38	.....	38	6	12
11	117	18	12	28	.....	28	6	10
12	79	18	10	24	.....	23	2	10
13	72	18	8	20	.....	21	2	10
14	66	18	8	14	.....	14	6	10
15	63	21	6.8	12	.....	16	6	10
16	66	23	6.8	10	.....	14	10	10
17	60	23	6.8	8	.....	14	10	10
18	50	26	6.8	6	.....	10	16	10
19	41	28	12	6	.....	8	16	10
20	38	30	18	8	.....	8	18	10
21	33	33	21	8	.....	6	18	10
22	30	38	18	8	.....	5	18	10
23	28	38	14	8	.....	4	16	.....
24	26	38	8	8	.....	4	16	.....
25	23	33	12	8	.....	3	18	.....
26	23	32	18	7	.....	2	14	.....
27	23	28	74	7	8	2	18	.....
28	21	27	305	6	36	2	12	.....
29	23	26	295	5	50	2	14	.....
30	21	23	270	5	60	2	14	.....
31	.....	26	.....	5	63	.....	14	.....

NOTE.—Discharge determined as follows: Apr. 1 to June 26 and after Aug. 26, from one poorly defined rating curve; June 27 to July 29, by indirect method for shifting channels. Discharge estimated July 30 and 31; Aug. 1–26, estimated at 5 second-feet.

Monthly discharge of Big Muddy Creek near Culbertson, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	526	21	107	6,370	C.
May	38	16	23.7	1,460	C.
June	305	6.8	43.3	2,580	C.
July	255	5.0	45.0	2,770	C.
August	63	.....	11.2	689	D.
September	69	2.0	25.6	1,520	C.
October	18	2.0	9.3	572	C.
November 1–22	16	10	11.5	502	C.
The period	.....	.....	.....	16,500	

YELLOWSTONE RIVER BASIN.

YELLOWSTONE RIVER NEAR CANYON STATION, YELLOWSTONE NATIONAL PARK.

Location.—In secs. 9–16, T. 13 S., R. 10 E., Montana meridian, one-eighth mile above Chittenden bridge, half a mile above Upper Falls, 1 mile south of Canyon station, and about 13 miles below outlet of Lake Yellowstone.

Records available.—June 22 to November 18, 1913.

Drainage area.—Not measured.

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Gage.—Vertical staff on left bank.

Control.—Rock. One channel at all stages.

Discharge measurements.—Can be made by wading at certain stages. When too deep to be waded, can be made by measuring flow at Fishing bridge and adding the inflow.

Winter flow.—Ice forms in the winter, but the falls remain open.

Accuracy.—Data insufficient for estimates of discharge.

Cooperation.—Gage heights and transportation are furnished by the Yellowstone National Park.

Estimates withheld for additional measurements.

The following discharge measurement was made by R. C. Pierce:

September 12.—Gage height, 2.31 feet; discharge, 2,160 second-feet.

Daily gage height, in feet, of Yellowstone River near Canyon station, Yellowstone National Park, for 1913.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	5.2	4.6	2.7	1.8	1.4	16	.....	4.8	3.45	.....	1.6	1.1
2	.....	5.15	4.65	2.7	1.8	1.4	17	.....	4.7	3.4	.....	1.6	1.05
3	.....	5.15	4.7	2.65	1.8	1.4	18	.....	4.55	3.35	.....	1.55	1.0
4	.....	5.15	4.7	2.6	1.75	1.4	19	.....	4.45	3.35	.....	1.55	.....
5	.....	5.05	4.6	2.55	1.7	1.4	20	.....	4.45	3.3	1.75	1.55	.....
6	.....	5.05	4.4	2.5	1.7	1.4	21	5.25	4.4	3.25	1.75	1.55	.....
7	.....	5.05	4.15	2.5	1.7	1.35	22	5.25	4.25	3.2	1.8	1.5	.....
8	.....	5.05	4.0	.....	1.7	1.35	23	5.35	4.3	3.1	1.8	1.5	.....
9	.....	4.95	3.9	.....	1.75	1.35	24	5.3	4.15	3.05	1.8	1.5	.....
10	.....	4.95	3.75	.....	1.75	1.3	25	5.35	4.2	3.0	1.85	1.5	.....
11	.....	4.95	3.75	.....	1.7	1.3	26	5.3	4.25	2.95	1.85	1.5	.....
12	.....	4.95	3.6	2.3	1.7	1.25	27	5.25	4.35	2.85	1.85	1.45	.....
13	.....	4.95	3.55	2.3	1.65	1.2	28	5.25	4.25	2.8	1.85	1.45	.....
14	.....	4.9	3.55	.....	1.6	1.15	29	5.25	4.25	2.75	1.85	1.45	.....
15	.....	4.85	3.55	.....	1.6	1.1	30	5.2	4.7	2.75	1.85	1.4	.....
							31	5.2	4.6	2.75	.....	1.4	.....

NOTE.—All gage heights reduced to datum of the permanent gage installed Sept. 13, 1913; no record was obtained Nov. 19 to Dec. 31, as water was below gage.

YELLOWSTONE RIVER AT CORWIN SPRINGS, MONT.

Location.—In the NE. ¼ sec. 30, T. 8 S., R. 8 E., in the canyon at Corwin Springs, Mont., 8 miles below Gardiner, the northern entrance to Yellowstone National Park.

Records available.—September 2, 1910, to December 31, 1913.

Drainage area.—2,630 square miles.

Gage.—A chain gage fastened to the floor of the highway bridge on the downstream side near the right bank. Previous to October 25, 1911, a staff gage set to the same datum and fastened to a pile beside the concrete abutment on the right bank.

Control.—Bed of stream rocky; free from vegetation.

Discharge measurements.—Made from the lower side of highway bridge.

Diversions.—No water is diverted from the Yellowstone above this station.

Storage.—Yellowstone Lake furnishes a natural but uncontrolled regulation.

The following discharge measurement was made by R. R. Randell:

May 31, 1913: Gage height, 8.90 feet; discharge, 18,000 second-feet.

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Daily gage height, in feet, of Yellowstone River at Corwin Springs, Mont., for 1913.

[Mrs. C. H. Wilks, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.4	2.9	9.0	6.9	5.9	3.4	2.1	1.7	1.4
2	.....	1.4	2.4	9.3	7.2	5.4	3.3	2.1	1.7	1.4
3	.....	1.5	2.5	9.1	7.1	5.2	3.3	2.1	1.6	1.3
4	.....	1.5	2.3	9.2	7.0	5.1	3.3	2.1	1.6	1.3
5	.....	1.3	2.2	9.3	6.8	5.1	3.3	2.0	1.6	1.2
6	.....	1.5	2.4	9.5	6.6	5.2	3.3	2.1	1.6	1.2
7	.....	1.4	2.7	9.3	6.5	5.2	3.2	2.2	1.6	1.2
8	.....	1.4	3.5	9.6	6.4	5.0	3.1	2.2	1.6	1.2
9	.....	1.5	4.4	9.3	6.4	5.0	3.1	2.2	1.6	1.2
10	.....	1.5	4.7	8.9	6.3	4.8	3.1	2.2	1.6	1.2
11	.....	1.5	5.0	8.4	6.3	4.8	3.1	2.1	1.6	1.1
12	.....	1.6	4.9	8.8	6.0	4.7	3.0	2.2	1.6	1.1
13	.....	1.8	4.8	9.0	5.8	4.7	2.9	2.2	1.5	1.1
14	.....	1.8	4.1	8.7	5.7	4.5	2.8	2.4	1.5	1.1
15	.....	1.9	3.9	8.5	5.4	4.5	2.7	2.1	1.5	.....
16	1.0	1.8	4.2	8.2	5.3	4.4	2.7	2.0	1.6	.....
17	1.0	2.0	4.5	8.4	5.3	4.2	2.6	2.0	1.6	.....
18	.9	2.0	4.3	8.3	5.3	4.1	2.6	1.9	1.5	.....
19	.....	2.3	4.4	8.3	5.2	4.0	2.6	1.9	1.5	.....
20	.....	2.2	4.1	8.4	5.2	3.7	2.5	1.8	1.4	.....
21	.....	2.2	4.2	8.3	5.2	3.6	2.5	1.8	1.4	.....
22	.....	2.4	4.7	8.0	5.3	3.6	2.6	1.8	1.4	.....
23	.....	2.1	5.6	7.5	5.1	3.5	2.5	1.8	1.4	.....
24	.....	2.2	6.1	7.8	5.2	3.5	2.4	1.8	1.4	.....
25	.....	2.0	6.6	7.5	4.9	3.5	2.4	1.9	1.3	.....
26	.....	2.1	7.5	7.2	5.3	3.4	2.4	1.7	1.4	.....
27	.....	2.3	8.4	7.2	5.5	3.4	2.4	1.7	1.5	.....
28	.....	2.6	8.7	6.9	5.9	3.4	2.3	1.8	.....	.....
29	.....	3.0	8.3	6.9	6.2	3.4	2.2	1.7	.....	.....
30	1.2	3.2	8.0	6.8	6.8	3.4	2.2	1.7	1.4	.....
31	1.1	.....	8.5	.....	6.2	3.4	.....	1.7	.....	.....

NOTE.—Ice at the gage previous to Mar. 16, Mar. 19–29, and after Dec. 14.

Daily discharge, in second-feet, of Yellowstone River at Corwin Springs, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1,300	2,910	18,300	11,900	9,030	3,680	1,910	1,530	1,300
2	.....	1,300	2,250	19,300	12,800	7,720	3,520	1,910	1,530	1,300
3	.....	1,370	2,370	18,600	12,500	7,230	3,520	1,910	1,450	1,230
4	.....	1,370	2,130	18,900	12,200	6,990	3,520	1,910	1,450	1,230
5	.....	1,230	2,020	19,300	11,600	6,990	3,520	1,810	1,450	1,160
6	.....	1,370	2,250	19,900	11,000	7,230	3,520	1,910	1,450	1,160
7	.....	1,300	2,630	19,300	10,700	7,230	3,360	2,020	1,450	1,160
8	.....	1,300	3,810	20,200	10,400	6,760	3,210	2,020	1,450	1,160
9	.....	1,370	5,470	19,300	10,400	6,760	3,210	2,020	1,450	1,160
10	.....	1,370	6,090	18,000	10,200	6,310	3,210	2,020	1,450	1,160
11	.....	1,370	6,760	16,400	10,200	6,310	3,210	1,910	1,450	1,100
12	.....	1,450	6,530	17,700	9,310	6,090	3,060	2,020	1,450	1,100
13	.....	1,620	6,310	18,300	8,760	6,090	2,910	2,020	1,370	1,100
14	.....	1,620	4,890	17,400	8,490	5,670	2,770	2,250	1,370	1,100
15	.....	1,710	4,530	16,800	7,720	5,670	2,630	1,910	1,370	.....
16	1,040	1,620	5,090	15,800	7,470	5,470	2,630	1,810	1,450	.....
17	1,040	1,810	5,670	16,400	7,470	5,080	2,500	1,810	1,450	.....
18	990	1,810	5,270	16,100	7,470	4,890	2,500	1,710	1,370	.....
19	1,000	2,130	5,470	16,100	7,230	4,710	2,500	1,710	1,370	.....
20	1,020	2,020	4,890	16,400	7,230	4,180	2,370	1,620	1,300	.....
21	1,030	2,020	5,090	16,100	7,230	4,010	2,370	1,620	1,300	.....
22	1,050	2,250	6,090	15,200	7,470	4,010	2,500	1,620	1,300	.....
23	1,060	1,910	8,230	13,700	6,990	3,840	2,370	1,620	1,300	.....
24	1,080	2,020	9,590	14,600	7,230	3,840	2,250	1,620	1,300	.....
25	1,080	1,810	11,060	13,700	6,530	3,840	2,250	1,710	1,230	.....
26	1,110	1,910	13,700	12,800	7,470	3,680	2,250	1,530	1,300	.....
27	1,120	2,130	16,400	12,800	7,970	3,680	2,250	1,530	1,370	.....
28	1,140	2,500	17,400	11,900	9,030	3,680	2,130	1,620	1,340	.....
29	1,150	3,060	16,100	11,900	9,870	3,680	2,020	1,530	1,320	
30	1,160	3,360	15,200	11,600	11,600	3,680	2,020	1,530	1,300	.....
31	1,100	.....	16,800	.....	9,870	3,680	.....	1,530	.....	.....

NOTE.—Discharge determined from a rating curve fairly well defined between 3,000 and 4,700 second-feet and well defined at other stages. Discharge estimated Mar. 19–29 and interpolated Nov. 28–29.

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Monthly discharge of Yellowstone River at Corwin Springs, Mont., for 1913.

[Drainage area, 2,630 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
March 16-31	1,160	990	1,070	0.407	0.24	34,000	C.
April	3,360	1,230	1,780	.677	.76	106,000	A.
May	17,400	2,020	7,190	2.73	3.15	442,000	A.
June	20,200	11,600	16,400	6.24	6.96	976,000	A.
July	12,800	6,530	9,240	3.51	4.06	568,000	A.
August	9,030	3,680	5,420	2.06	2.38	333,000	A.
September	3,680	2,020	2,790	1.06	1.18	166,000	A.
October	2,250	1,530	1,800	.684	.79	111,000	A.
November	1,530	1,230	1,390	.529	.59	82,700	A.
December 1-14	1,300	1,100	1,170	.445	.23	32,500	A.
The period						2,850,000	

YELLOWSTONE RIVER AT HUNTLEY, MONT.

Location.—In the SW. ¼ sec. 24, T. 2 N., R. 27 E., at new steel highway bridge 1 mile below Huntley, Mont., 1 mile below Pryor Creek. Station replaces that formerly maintained at Junction.

Records available.—October 1, 1907, to December 31, 1913. A station was maintained May 10, 1906, to December 31, 1907, at Junction, Mont., where the flow is practically the same as at Huntley.

Drainage area.—12,000 square miles.

Gage.—Chain fastened to bridge rail; datum unchanged.

Channel.—Shifts.

Discharge measurements.—Made from downstream side of bridge.

Winter flow.—River frozen entirely over in places during winter, but during the coldest seasons open channels with floating ice are not of uncommon occurrence.

Diversions.—The Huntley canal, built by the United States Reclamation Service, takes water from the river about 2 miles above the gaging station; its normal capacity is 400 second-feet, and it supplies the water for 29,000 acres of land. Near Laurel are the headgates of the Billings Land & Irrigation Co.'s canal, which carries about 305 second-feet and irrigates 28,000 acres. Many small ditches take water from the tributaries of the Yellowstone, but few from the stream itself, owing to the variation of the stage of the water surface and consequent difficulty of diversion.

Accuracy.—Conditions for obtaining accurate data at this station are only fair and many discharge measurements are necessary to define a good rating curve.

Discharge measurements of Yellowstone River at Huntley, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 23	R. R. Randell	3.16	6,680	Aug. 22	J. M. Ray	4.62	8,770
June 28	do	8.19	24,800	Oct. 3	do	3.96	4,170

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Daily gage height, in feet, of Yellowstone River at Huntley, Mont., for 1913.

[E. V. Carpenter, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.1	5.1	4.4	5.4	3.4	10.0	8.1	7.4	4.4	3.9	4.0	3.7
2	2.1	5.1	4.5	5.5	3.2	10.4	8.0	6.7	4.4	3.9	4.2	3.7
3	2.1	5.0	4.5	3.9	3.2	10.5	8.2	6.0	4.5	4.0	4.2	3.6
4	2.1	4.9	4.6	3.3	3.1	10.3	8.1	6.3	4.4	4.0	4.1	3.4
5	2.3	4.9	4.7	3.5	3.0	10.2	8.2	6.0	4.5	4.0	4.0	3.4
6	4.8	4.9	4.6	3.5	2.9	10.2	8.0	6.0	4.4	4.1	4.0	3.4
7	4.8	4.8	4.7	4.1	2.8	10.4	8.0	6.0	4.4	4.1	4.0	3.4
8	4.8	4.8	4.9	3.6	3.0	10.3	7.9	5.8	4.3	4.1	4.0	3.6
9	4.9	4.8	4.8	2.8	3.1	10.2	7.6	5.9	4.3	4.2	4.0	3.9
10	5.1	4.7	4.7	2.6	4.0	9.9	7.6	6.0	4.2	4.3	3.9	3.8
11	5.1	4.7	4.1	2.6	4.6	9.7	7.4	6.3	4.3	4.2	3.9	3.8
12	5.3	4.8	4.0	2.8	5.4	10.2	7.2	6.0	4.2	4.2	3.8	3.8
13	5.3	4.8	3.9	2.9	5.6	10.6	7.4	5.7	4.2	4.2	3.9	3.8
14	5.3	5.0	3.6	2.9	5.0	10.1	6.4	5.7	4.1	4.2	3.9	3.9
15	5.4	5.1	3.5	3.0	4.6	10.0	6.2	5.5	4.1	4.1	3.9	3.9
16	5.4	5.3	3.5	2.9	4.5	10.0	5.9	5.4	4.1	4.2	3.8	3.9
17	5.4	4.3	.....	3.0	4.4	9.8	5.8	5.3	4.1	4.1	3.8	3.8
18	5.4	4.3	.....	3.0	4.3	9.6	5.7	5.2	4.1	4.0	3.8	3.8
19	5.4	4.6	.....	3.0	4.2	9.8	5.6	5.0	4.0	4.0	3.8	3.7
20	4.9	4.6	.....	3.0	4.6	9.9	5.6	4.9	3.9	4.0	3.8	3.6
21	4.9	4.6	.....	.....	4.4	9.6	5.5	4.7	4.0	4.0	3.8	3.6
22	4.9	4.6	.....	.....	4.3	9.4	5.6	4.6	4.0	4.0	3.8	3.6
23	5.1	4.6	.....	3.1	4.1	9.1	5.7	4.5	4.1	4.0	3.8	3.6
24	5.1	4.6	.....	3.2	4.6	9.1	5.8	4.5	4.2	4.0	3.7	3.6
25	5.4	4.4	.....	3.0	7.0	9.0	5.8	4.5	4.2	4.0	3.7	3.6
26	5.4	3.9	.....	3.0	7.8	8.7	5.6	4.4	4.1	4.0	3.7	3.6
27	5.4	4.3	.....	2.8	9.2	8.2	6.0	4.4	4.1	4.1	3.7	3.6
28	5.4	4.4	.....	2.7	10.0	8.2	6.4	4.3	4.0	4.0	3.7	3.9
29	5.3	.....	.....	3.2	10.5	8.2	6.1	4.4	4.0	4.0	3.7	3.7
30	5.2	.....	6.4	3.5	10.3	8.2	6.2	4.4	4.0	4.0	3.7	3.6
31	5.1	.....	6.0	.....	9.6	.....	6.9	4.3	.....	4.0	.....	3.6

NOTE.—Jan. 1 to Apr. 8, gage heights affected by ice.

Daily discharge, in second-feet, of Yellowstone River at Huntley, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	7,750	42,000	24,400	21,500	7,000	4,100	4,450	3,500
2	.....	7,050	44,400	23,800	17,500	7,000	4,100	5,150	3,500
3	.....	7,050	45,000	25,000	13,700	7,300	4,450	5,150	3,200
4	.....	6,700	43,800	24,400	15,300	7,000	4,450	4,800	2,700
5	.....	6,350	43,200	25,000	14,200	7,300	4,450	4,450	2,700
6	.....	6,000	43,200	23,800	14,200	6,500	4,800	4,450	2,700
7	.....	5,650	44,400	23,800	14,200	6,500	4,800	4,450	2,700
8	.....	6,350	43,800	23,200	13,000	6,000	4,800	4,450	3,200
9	5,650	6,700	43,200	21,400	13,700	6,000	5,150	4,450	4,100
10	4,950	10,100	41,400	21,400	14,800	5,700	5,500	4,100	3,800
11	4,950	12,800	40,200	20,200	16,500	5,800	5,150	4,100	3,800
12	5,650	16,600	43,200	19,200	14,800	5,500	5,150	3,800	3,800
13	6,000	17,600	45,600	20,200	13,000	5,500	5,150	4,100	3,800
14	6,000	14,600	41,300	14,800	13,000	5,100	5,150	4,100	4,100
15	6,350	12,800	40,800	13,700	12,700	5,100	4,800	4,100	4,100
16	6,000	12,400	40,800	12,200	12,200	4,800	5,150	3,800	4,100
17	6,350	11,900	39,000	11,700	11,500	4,800	4,800	3,800	3,800
18	6,350	11,400	37,300	11,200	11,200	4,800	4,450	3,800	3,800
19	6,350	11,000	37,700	10,700	10,300	4,450	4,450	3,800	3,500
20	6,350	12,800	37,800	10,700	9,800	4,100	4,450	3,800	3,200
21	6,450	11,900	35,500	10,200	9,300	4,450	4,450	3,800	3,200
22	6,600	11,400	34,200	10,700	8,700	4,450	4,450	3,800	3,200
23	6,700	10,600	32,000	11,200	8,200	4,800	4,450	3,800	3,200
24	7,050	12,800	31,300	11,700	8,200	5,150	4,450	3,500	3,200
25	6,350	24,800	31,000	11,700	8,200	5,150	4,450	3,500	3,200
26	6,350	29,200	28,500	10,700	7,300	4,800	4,450	3,500	3,200
27	5,650	37,200	25,000	13,200	7,300	4,800	4,800	3,500	3,200
28	5,300	42,000	25,000	15,300	7,000	4,450	4,450	3,500	4,100
29	7,050	45,000	25,000	13,700	7,300	4,450	4,450	3,500	3,500
30	8,100	43,800	25,000	14,300	7,300	4,450	4,450	3,500	3,200
31	.....	39,600	.....	18,500	7,000	.....	4,450	.....	3,200

NOTE.—Discharge determined as follows: Apr. 9 to June 13, from a rating curve fairly well defined for 1912 but poorly defined for 1913; June 14–26 and July 27 to Sept. 15, by indirect method for shifting channels; June 27 to July 26 and Sept. 16 to Dec. 31, from a poorly defined rating curve. Discharge interpolated Apr. 21-22.

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Monthly discharge of Yellowstone River at Huntley, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 9–30	8,100	4,950	6,210	271,000	C.
May	45,000	5,650	16,500	1,010,000	C.
June	45,600	25,000	37,700	2,240,000	C.
July	25,000	10,200	16,800	1,030,000	C.
August	21,500	7,000	11,700	719,000	C.
September	7,300	4,100	5,440	324,000	C.
October	5,500	4,100	4,660	287,000	C.
November	5,150	3,500	4,030	240,000	C.
December	4,100	2,700	3,440	212,000	C.
The period				6,330,000	

YELLOWSTONE RIVER AT INTAKE, MONT.

Location.—At the Lower Yellowstone diversion dam at Intake in NW. ¼ sec. 36, T. 18 N., R. 56 E., 18 miles below Glendive, Mont.

Records available.—January 1, 1911, to December 31, 1913. Records were obtained at Glendive, 18 miles above by the War Department and Department of Agriculture from 1893 to 1903, and by the Geological Survey from August 1, 1903, to December 31, 1910.

Gage.—A chain gage on the north abutment of the dam. The gage readings show the depth of water on the crest of the dam.

Winter flow.—Affected by ice.

The dam.—The dam, a rock-filled timber-crib structure on a pile foundation, was completed January 29, 1910. It is 700 feet long, crosses the stream at right angles to the current, and raises the low-water level of the river about 4 feet. The dam is specially designed to resist the destructive effects of ice by having an approach on a slope of 3 to 1, and the downstream face is ogee-shaped and protected by a heavy rock apron.

Diversions.—The Lower Yellowstone canal, which diverts water to irrigate 66,000 acres of land, has its headworks at the north abutment.

Accuracy.—A curve showing relation of gage heights at Glendive and at Lower Yellowstone dam was constructed. Using this curve of relation and discharge measurements made at Glendive, a discharge curve was constructed which is applicable to the gage heights of Lower Yellowstone dam, and should give fair results.

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Daily gage height, in feet, of Yellowstone River at Intake, Mont., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.7	1.5	2.0	12.1	2.3	7.5	5.6	4.7	2.0	1.9	1.8	1.6
2	2.1	1.5	1.7	12.5	2.7	7.4	5.8	4.9	2.0	1.9	1.8	1.6
3	2.1	1.5	1.6	9.5	2.9	7.5	5.8	4.6	2.0	1.9	1.8	1.6
4	2.0	1.4	2.45	7.2	3.1	7.7	5.6	4.3	2.0	1.8	1.8	1.6
5	1.7	1.4	2.4	6.3	3.1	7.7	5.6	4.0	2.0	1.8	1.75	1.6
6	1.5	1.4	2.45	5.5	2.9	7.5	5.5	3.9	2.1	1.95	1.8	1.5
7	1.5	1.4	3.3	5.1	2.7	7.3	5.4	3.8	2.15	2.2	1.8	1.5
8	1.4	1.4	4.1	4.9	2.6	7.2	5.3	3.8	2.1	2.3	1.8	1.5
9	1.4	1.4	.....	4.9	2.45	7.1	5.1	3.7	2.0	2.2	1.7	1.5
10	1.3	1.4	.....	4.3	2.3	7.1	5.1	3.8	2.0	2.2	1.8	1.5
11	1.2	1.4	.....	3.2	2.3	7.3	5.0	3.9	1.9	2.2	1.7	1.5
12	1.2	1.4	.....	2.9	2.9	7.0	4.9	3.9	1.85	2.2	1.7	1.5
13	1.2	1.4	.....	2.7	3.7	6.9	4.7	3.9	1.8	2.2	1.7	1.5
14	1.2	1.5	.....	2.6	4.3	6.7	4.7	3.5	1.8	2.15	1.7	1.5
15	1.1	1.6	.....	2.6	4.5	6.9	4.4	3.3	1.8	2.1	1.8	1.5
16	1.1	2.1	3.1	2.6	4.1	6.5	4.1	3.3	2.2	2.0	1.8	1.5
17	1.1	2.2	2.7	2.7	4.1	6.6	3.9	5.1	2.1	2.0	1.7	1.5
18	1.1	3.2	2.6	2.9	3.8	6.3	3.8	5.1	2.1	1.9	1.7	1.5
19	1.1	4.3	2.5	3.1	3.7	5.9	3.7	3.8	2.05	1.8	1.7	1.5
20	1.2	5.0	2.4	3.0	3.8	6.0	3.5	3.1	2.0	1.8	1.7	1.5
21	1.3	3.9	2.2	3.1	3.5	6.9	3.3	2.7	2.05	1.8	1.7	1.5
22	1.4	3.8	2.2	3.2	3.5	6.6	3.3	2.6	2.1	1.8	1.7	1.5
23	1.4	3.5	.....	3.2	3.5	6.3	3.3	2.5	2.15	1.8	1.7	1.5
24	1.4	3.0	.....	3.2	3.5	6.3	3.1	2.4	2.2	1.8	1.7	1.5
25	1.4	3.0	.....	3.2	3.5	6.1	3.0	2.25	2.4	1.8	1.7	1.5
26	1.5	2.6	.....	3.1	3.5	6.0	3.3	2.2	2.4	1.7	1.6	1.5
27	1.5	2.35	.....	3.0	4.3	6.1	3.5	2.15	2.3	1.8	1.6	1.5
28	1.5	2.3	.....	2.7	5.3	6.3	3.7	2.0	2.2	1.8	1.6	1.5
29	1.6	.....	.....	2.5	6.1	6.1	4.1	2.0	2.2	1.8	1.6	1.5
30	1.6	.....	2.7	2.4	6.9	5.7	4.5	2.0	2.1	1.8	1.6	1.5
31	1.6	.....	9.1	.....	7.5	.....	4.6	2.0	.....	1.7	.....	1.5

NOTE.—Gage heights have been increased 0.7 foot for error in gage found Apr. 21, 1914. Discharge relation believed to have been affected by ice Feb. 16 to 28; Mar. 1 to 15; and Mar. 23 to Apr. 10.

Daily discharge, in second-feet, of Yellowstone River at Intake, Mont., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	6,240	5,300	.....	.....	9,540	70,600	42,200	30,800	7,800	7,260	6,740	5,760
2	8,360	5,300	.....	.....	12,200	69,100	45,000	33,100	7,800	7,260	6,740	5,760
3	8,360	5,300	.....	.....	13,600	70,600	45,000	29,600	7,800	7,260	6,740	5,760
4	7,800	4,860	.....	.....	15,200	73,800	42,200	26,400	7,800	6,740	6,740	5,760
5	6,240	4,860	.....	.....	15,200	73,800	42,200	23,400	7,800	6,740	6,490	5,760
6	5,300	4,860	.....	.....	13,600	70,600	40,800	22,400	8,360	7,530	6,740	5,300
7	5,300	4,860	.....	.....	12,200	67,600	39,400	21,400	8,650	8,940	6,740	5,300
8	4,860	4,860	.....	.....	11,500	66,000	38,100	21,400	8,360	9,540	6,740	5,300
9	4,860	4,860	.....	.....	10,500	64,400	35,600	20,400	7,800	8,940	6,240	5,300
10	4,440	4,860	.....	.....	9,540	64,400	35,600	21,400	7,800	8,940	6,740	5,300
11	4,040	4,860	.....	16,000	9,540	67,600	34,300	22,400	7,260	8,940	6,240	5,300
12	4,040	4,860	.....	13,600	13,600	62,900	33,100	22,400	7,000	8,940	6,240	5,300
13	4,040	4,860	.....	12,200	20,400	61,400	30,800	22,400	6,740	8,940	6,240	5,300
14	4,040	5,300	.....	11,500	26,400	58,200	30,800	18,600	6,740	8,650	6,240	5,300
15	3,660	5,760	.....	11,500	28,600	61,400	27,500	16,800	6,740	8,360	6,740	5,300
16	3,660	.....	15,200	11,500	24,400	55,200	24,400	16,800	8,940	7,800	6,740	5,300
17	3,660	.....	12,200	12,200	24,400	56,800	22,400	35,600	8,360	7,800	6,240	5,300
18	3,660	.....	11,500	13,600	21,400	52,200	21,400	35,600	8,360	7,260	6,240	5,300
19	3,660	.....	10,800	15,200	20,400	46,400	20,400	21,400	8,080	6,740	6,240	5,300
20	4,040	.....	10,200	14,400	21,400	47,900	18,600	15,200	7,800	6,740	6,240	5,300
21	4,440	.....	9,240	15,200	18,600	61,400	16,800	12,200	8,080	6,740	6,240	5,300
22	4,860	.....	8,940	16,000	18,600	56,800	16,800	11,500	8,360	6,740	6,240	5,300
23	4,860	.....	.....	16,000	18,600	52,200	16,800	10,800	8,650	6,740	6,240	5,300
24	4,860	.....	.....	16,000	18,600	52,200	15,200	10,200	8,940	6,740	6,240	5,300
25	4,860	.....	.....	16,000	18,600	49,400	14,400	9,240	10,200	6,740	6,240	5,300
26	5,300	.....	.....	15,200	18,600	47,900	16,800	8,940	10,200	6,240	5,760	5,300
27	5,300	.....	.....	14,400	26,400	49,400	18,600	8,650	9,540	6,740	5,760	5,300
28	5,300	.....	.....	12,200	38,100	52,200	20,400	8,080	8,940	6,740	5,760	5,300
29	5,760	.....	.....	10,800	49,400	49,400	24,400	7,800	8,940	6,740	5,760	5,300
30	5,760	.....	.....	10,200	61,400	43,600	28,600	7,800	8,360	6,740	5,760	5,300
31	5,760	.....	.....	.....	70,600	.....	29,600	7,800	.....	6,240	.....	5,300

NOTE.—Discharge determined from a rating curve which is believed to be fairly well defined and which was obtained by a curve of gage height relation from the rating curve for the old station at Glendive. Mean discharge estimated as follows: Feb. 16 to 28 at 4,000 second-feet; Mar. 1 to 15 at 6,000 second-feet; Mar. 23 to 31 at 15,000 second-feet; Apr. 1 to 10 at 25,000 second-feet.

Attention is called to the probability that the daily discharges published in Water-Supply Paper 326 for October to December, 1912, may be considerably in error because of the gage error found on Apr. 21, 1914. Hydrograph comparisons indicate that this error probably existed after Oct. 18, 1912.

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Monthly discharge of Yellowstone River at Intake, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	8,360	3,660	5,070	312,000	C.
February	.....	.....	4,560	253,000	D.
March	.....	.....	9,780	601,000	D.
April	.....	10,200	17,500	1,040,000	D.
May	70,600	9,540	22,300	1,370,000	B.
June	73,800	43,600	59,200	3,520,000	B.
July	45,000	14,400	28,700	1,760,000	B.
August	25,600	7,800	18,700	1,150,000	B.
September	10,200	6,740	8,210	489,000	B.
October	9,540	6,240	7,500	461,000	B.
November	6,740	5,760	6,340	377,000	B.
December	5,760	5,300	5,370	330,000	B.
The year	73,800	3,660	16,100	11,700,000	

BIG TIMBER CREEK NEAR BIG TIMBER, MONT.

Location.—At Webb's ranch, about 9 miles northwest of Big Timber, Mont.

Records available.—April 13, 1912, to December 31, 1913. Stations were maintained on the North and South forks of Big Timber Creek May 6, 1907, to December 31, 1911.

Drainage area.—Not measured.

Gage.—Chain gage on left bank.

Control.—Shifts during high water.

Discharge measurements.—Made by wading at all stages. Above the gage are several channels which may be measured separately at high stages.

Winter flow.—Affected by ice.

Diversions.—Much water is diverted for irrigation above the station.

Accuracy.—Conditions for obtaining accurate discharge data good.

Discharge measurements of Big Timber Creek near Big Timber, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Apr. 26	R. R. Randell.....	2.04	44	Aug. 22	C. S. Heidel.....	2.53	45
May 28	.....do.....	3.34	405	Oct. 2	J. M. Ray.....	2.45	36
June 25	.....do.....	3.06	185				

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Daily gage height, in feet, of Big Timber Creek near Big Timber, Mont., for 1913.

[Leslie E. Webb, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.12	3.25	3.1	2.65	2.48	2.42	2.5	2.40
2	1.8	2.15	3.35	3.05	2.65	2.45	2.42	2.5	2.42
3	2.1	2.2	3.2	3.0	2.6	2.45	2.42	2.5	2.40
4	2.0	2.1	3.1	.....	2.6	2.5	2.42	2.5	2.38
5	2.2	2.15	3.1	3.0	2.6	2.55	2.45	2.5	2.38
6	2.4	2.0	3.2	3.0	2.6	2.48	2.55	2.5	2.38
7	2.2	2.0	2.95	3.1	2.6	.....	2.48	2.5	.....
8	2.3	2.0	3.2	3.05	2.55	.....	2.48	2.5	.....
9	2.3	2.25	3.2	2.95	2.55	.....	2.45	2.5	.....
10	1.9	2.32	3.25	2.95	2.55	.....	2.5	2.5	.....
11	2.1	2.6	4.4	2.9	2.5	.....	2.5	2.50	.....
12	1.9	2.32	3.75	2.9	2.5	.....	2.5	2.48	.....
13	2.3	2.45	3.6	2.9	2.5	.....	2.5	2.48	.....
14	2.2	2.45	3.7	2.75	2.5	.....	2.5	2.48	.....
15	2.1	2.55	3.6	2.65	2.5	.....	2.5	2.48	.....
16	2.3	2.6	3.55	2.6	2.5	.....	2.50	2.45	.....
17	2.1	2.4	3.5	2.6	2.48	.....	2.48	2.45	.....
18	2.1	2.3	3.4	2.6	2.45	2.5	2.48	2.45	.....
19	2.2	2.3	3.45	2.7	2.48	2.48	2.48	2.45	.....
20	2.1	2.32	3.4	2.7	2.48	2.42	2.48	2.45	.....
21	2.1	2.3	3.3	2.7	2.48	2.42	2.58	2.45	.....
22	1.8	2.25	3.2	2.75	2.48	2.42	2.55	2.45	.....
23	2.2	2.4	3.2	3.1	2.5	2.42	2.55	2.42	.....
24	2.0	2.52	3.1	2.95	2.5	2.4	2.55	2.42	.....
25	2.0	2.9	3.1	2.8	2.5	2.4	2.55	2.42	.....
26	2.1	3.35	3.05	2.9	2.5	2.4	2.52	2.42	.....
27	2.15	3.5	3.8	2.95	2.5	2.4	2.55	2.4	.....
28	2.15	3.4	3.4	2.75	2.5	2.4	2.55	2.4	.....
29	2.2	3.5	3.3	2.7	2.5	2.4	2.55	2.4	.....
30	2.2	3.1	3.2	2.8	2.5	2.4	2.52	2.4	.....
31	.....	3.1	.....	2.72	2.5	.....	2.50	.....	.....

Daily discharge, in second-feet, of Big Timber Creek near Big Timber, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	20	52	360	204	68	33	24	36	21
2	21	56	401	186	68	28	24	36	24
3	49	62	340	168	56	28	24	36	21
4	38	49	302	168	56	36	24	36	19
5	62	56	302	168	56	46	28	36	19
6	96	38	340	168	56	33	46	36	19
7	62	38	249	204	56	33	33	36	.....
8	78	38	340	186	46	33	33	36	.....
9	78	70	340	152	46	33	28	36	.....
10	28	82	360	152	46	33	36	36	.....
11	49	142	882	137	36	33	36	36	.....
12	28	82	576	137	36	33	36	33	.....
13	78	107	502	137	36	36	36	33	.....
14	62	107	537	94	36	36	36	33	.....
15	49	130	484	68	36	36	36	33	.....
16	78	142	454	56	36	36	36	28	.....
17	49	96	424	56	33	36	33	28	.....
18	49	78	374	56	28	36	33	28	.....
19	62	78	387	80	33	33	33	28	.....
20	49	82	358	80	33	24	33	28	.....
21	49	78	310	80	33	24	52	28	.....
22	21	70	264	94	33	24	46	28	.....
23	62	96	256	204	36	24	46	24	.....
24	38	123	211	152	36	21	46	24	.....
25	38	232	204	108	36	21	46	24	.....
26	49	401	186	137	36	21	40	24	.....
27	56	466	484	152	36	21	46	21	.....
28	56	422	318	94	36	21	46	21	.....
29	62	466	279	80	36	21	46	21	.....
30	62	302	241	108	36	21	40	21	.....
31	.....	302	.....	86	36	.....	36	.....	.....

NOTE.—Discharge determined as follows: Apr. 2 to June 10 from a fairly well-defined rating curve; June 11–25, by indirect method for shifting channels; June 26 to Dec. 6, from a rating curve fairly well defined between 6 and 320 second-feet and poorly defined at higher stages. Discharge estimated Apr. 1 and interpolated July 4 and Sept. 7–17.

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Monthly discharge of Big Timber Creek near Big Timber, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	96	20	52.6	3,130	B.
May	466	38	147	9,049	B.
June	882	186	369	22,000	C.
July	204	56	127	7,810	B.
August	68	28	41.5	2,550	B.
September	46	21	29.8	1,770	C.
October	52	24	36.7	2 260	B.
November	36	21	30.1	1 790	B.
December 1-6	24	19	20.5	244	B.
The period				50,600	

BOULDER RIVER NEAR CONTACT, MONT.

Location.—In the SE. ¼ sec. 14, T. 3 S., R. 12 E., at ranch of G. W. Baker, about 6 miles above McLeod post office, 4 miles from Contact, Mont., and 2½ miles below the Boulder Falls.

Records available.—May 1, 1910, to December 31, 1913.

Drainage area.—234 square miles.

Gage.—Staff, fastened to left abutment of private wagon bridge near the ranch buildings.

Control.—Rocky; shifting slightly.

Discharge measurements.—Made from bridge or by wading just above the foot-bridge, which is about 400 yards above the gage.

Winter flow.—Affected by ice.

Accuracy.—Results good.

Discharge measurements of Boulder River near Contact, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Mar. 21	W. A. Lamb	a2.4	54
Apr. 28	R. R. Randell	b3.03	253
May 29	....do	6.08	2,440
Aug. 25	C. S. Heidel	3.05	319

a Ice present.

b Hydrographer notes that a fence across the stream below the gage may have caused backwater at the time of this measurement, but apparently the effect was very slight.

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Daily gage height, in feet, of Boulder River near Contact, Mont., for 1913.

[G. W. Baker, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	3.15	6.8	4.8	3.7	3.05	2.55	2.55
2	.....	2.85	6.6	4.8	3.65	3.05	2.55	2.55
3	.....	2.75	6.6	4.8	3.7	2.95	2.55	2.55
4	.....	2.75	6.6	4.7	3.7	2.95	2.55	2.5
5	.....	2.9	7.3	4.6	3.75	2.85	2.55	2.5
6	.....	2.75	7.2	4.6	3.65	2.85	2.6	2.45
7	.....	2.75	6.5	4.5	4.2	2.75	2.6	2.45
8	.....	2.85	6.4	4.6	3.9	2.75	2.65	2.45
9	.....	2.95	6.3	4.4	3.9	2.65	2.65	2.45
10	.....	3.2	6.2	4.7	3.8	2.65	2.65	2.45
11	.....	4.05	6.2	4.5	3.75	2.65	2.65	2.4
12	.....	4.05	5.9	4.5	3.75	2.55	2.65	2.4
13	.....	3.8	5.9	4.3	3.65	2.55	2.65	2.4
14	.....	3.75	5.9	4.0	3.65	2.55	2.6	2.4
15	.....	3.6	6.1	3.8	3.55	2.55	2.6	2.4
16	.....	3.45	6.0	3.8	3.55	2.45	2.55	2.35
17	.....	3.35	5.8	3.65	3.55	2.45	2.55	2.35
18	.....	3.35	5.8	3.65	3.55	2.45	2.55	2.35
19	.....	3.25	5.9	3.55	3.45	2.45	2.55	2.35
20	.....	3.4	5.8	3.55	3.45	2.45	2.65	2.3
21	.....	3.35	5.6	3.6	3.35	2.45	2.65	2.3
22	.....	3.45	5.7	3.6	3.25	2.5	2.65	2.3
23	.....	3.55	5.6	3.75	3.25	2.5	2.55	2.3
24	.....	3.75	5.6	3.8	3.15	2.45	2.55	2.25
25	.....	4.0	5.4	3.8	3.15	2.45	2.55	2.25
26	3.1	4.3	5.3	3.7	3.15	2.45	2.55	2.25
27	3.15	6.1	5.2	3.7	3.05	2.45	2.65	2.25
28	3.2	6.9	5.1	3.65	3.05	2.5	2.65	2.25
29	3.2	6.9	5.0	3.65	3.15	2.5	2.65	2.25
30	3.25	7.4	4.9	3.7	3.15	2.55	2.65	2.25
31	.....	6.7	.....	3.7	.....	.....	2.6	.....

Daily discharge, in second-feet, of Boulder River near Contact, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	325	3,160	1,430	645	308	138	138
2	.....	200	2,980	1,430	615	308	138	138
3	.....	165	2,980	1,430	645	265	138	138
4	.....	165	2,980	1,350	645	265	138	125
5	.....	220	3,610	1,270	675	228	138	125
6	.....	165	3,520	1,270	615	228	150	112
7	.....	165	2,890	1,190	965	195	150	112
8	.....	200	2,800	1,270	765	195	165	112
9	.....	240	2,710	1,110	765	165	165	112
10	.....	350	2,620	1,350	705	165	165	112
11	.....	860	2,620	1,190	675	165	165	100
12	.....	860	2,350	1,190	675	138	165	100
13	.....	695	2,350	1,040	615	138	165	100
14	.....	662	2,350	830	615	138	150	100
15	.....	570	2,530	705	558	138	150	100
16	.....	482	2,440	705	558	112	138	90
17	.....	428	2,260	615	558	112	138	90
18	.....	428	2,260	615	558	112	138	90
19	.....	375	2,350	558	502	112	138	90
20	.....	455	2,260	558	502	112	165	80
21	.....	428	2,080	585	450	112	165	80
22	.....	482	2,170	585	400	125	165	80
23	.....	540	2,080	675	400	125	138	80
24	.....	662	2,080	705	352	112	138	70
25	.....	825	1,920	705	352	112	138	70
26	300	1,040	1,830	645	352	112	138	70
27	325	2,530	1,750	645	308	112	165	70
28	350	3,250	1,670	615	308	125	165	70
29	350	3,250	1,590	615	352	125	165	70
30	375	3,700	1,510	645	352	138	165	70
31	.....	3,070	.....	645	330	.....	150	.....

NOTE.—Discharge determined as follows: Apr. 26 to May 25, from a rating curve fairly well defined; May 26 to Nov. 30, from a rating curve fairly well defined above 300 second-feet and poorly defined at lower stages.

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Monthly discharge of Boulder River near Contact, Mont., for 1913.

[Drainage area, 234 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
April 26–30	375	300	340	1.45	0.27	3,370	B.
May	3,700	165	896	3.83	4.42	55,100	B.
June	3,610	1,510	2,420	10.3	11.49	144,000	B.
July	1,430	558	909	3.88	4.47	55,900	B.
August	965	308	542	2.32	2.68	33,300	B.
September	308	112	160	.684	.76	9,520	C.
October	165	138	151	.645	.74	9,280	C.
November	138	70	96.5	.412	.46	5,740	C.
The period						316,000	

BOULDER RIVER NEAR McLEOD, MONT.

Location.—At the bridge at Loasby's ranch, 17 miles southwest of Big Timber and half a mile below McLeod.

Records available.—April 17, 1912, to December 31, 1913. Previous records were obtained on Boulder River near Contact and on East Boulder and West Boulder.

Drainage area.—Not measured.

Gage.—Staff spiked to lower side of middle pier of bridge.

Channel.—Probably permanent.

Discharge measurements.—Made from the bridge at the gage.

Winter flow.—Affected by ice.

Diversions.—Water is diverted from the principal tributaries for irrigation.

Accuracy.—Conditions for obtaining accurate discharge data good.

Discharge measurements of Boulder River near McLeod, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 22	W. A. Lamb	[a] 4.41	122	June 26	R. R. Randell	6.05	2,000
Apr. 29	R. R. Randell	4.31	472	Aug. 24	C. S. Heidel	4.30	520
May 30	....do	7.00	3,650				

[a] Ice present.

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Daily gage height, in feet, of Boulder River near McLeod, Mont., for 1913.

[S. H. Nicholson, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	4.15	7.4	6.2	5.6	4.4	4.0	3.9
2	4.15	7.4	6.1	5.4	4.3	4.0	3.9
3	4.15	7.5	6.2	5.2	4.2	4.0	3.9
4	4.05	7.3	6.2	5.2	4.2	4.0	3.9
5	4.05	7.4	6.2	5.2	4.1	4.0	3.9
6	4.05	7.4	6.3	5.1	4.1	4.0	3.9
7	4.15	7.6	6.3	5.0	4.1	4.0	3.9
8	4.45	7.3	6.4	5.0	4.1	4.0	3.9
9	4.95	7.3	6.2	5.6	4.1	4.0	3.8
10	5.25	7.0	6.1	5.5	4.1	4.0	3.8
11	5.35	7.0	6.0	5.2	4.1	4.1	3.8
12	5.5	7.3	5.9	5.1	4.1	4.1	3.8
13	5.15	7.3	5.9	5.0	4.0	4.1	3.8
14	5.05	7.1	5.6	5.0	4.0	4.1	3.8
15	5.05	7.2	5.4	4.9	4.0	4.1	3.8
16	4.95	6.9	5.4	4.8	4.0	.....	3.8
17	4.75	7.0	5.3	4.8	4.0	4.1	3.8
18	4.75	6.9	5.3	4.7	4.0	4.1	3.8
19	4.65	6.9	5.2	4.6	4.0	4.0	3.8
20	4.65	6.8	5.2	4.5	4.0	4.0	3.8
21	4.65	6.7	5.3	4.5	4.0	4.0	3.8
22	4.75	6.7	5.2	4.5	4.1	4.0	3.8
23	4.95	6.5	5.1	4.4	4.1	4.0	3.7
24	5.8	6.3	5.1	4.4	4.1	4.0	3.7
25	6.0	6.4	5.2	4.3	4.0	4.0	3.7
26	6.8	6.2	5.2	4.3	4.0	4.0	3.7
27	7.2	6.2	5.4	4.3	4.0	4.1	3.7
28	7.4	6.1	5.2	4.3	4.0	4.1	3.7
29	7.5	6.3	5.1	4.3	4.0	4.0	3.7
30	7.1	6.1	6.1	4.5	4.0	4.0	3.7
31	7.4	.....	5.7	4.6	.....	3.9	.....

Daily discharge, in second-feet, of Boulder River near McLeod, Mont., for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	400	4,420	2,210	1,500	600	410	370
2	400	4,420	2,070	1,300	550	410	370
3	400	4,650	2,210	1,130	500	410	370
4	360	4,200	2,210	1,130	500	410	370
5	360	4,420	2,210	1,130	450	410	370
6	360	4,420	2,350	1,050	450	410	370
7	400	4,880	2,350	970	450	410	370
8	545	4,200	2,500	970	450	410	370
9	820	4,200	2,210	1,500	450	410	330
10	1,020	3,550	2,070	1,400	450	410	330
11	1,100	3,550	1,940	1,130	450	450	330
12	1,220	4,200	1,820	1,050	450	450	330
13	955	4,200	1,820	970	410	450	330
14	885	3,760	1,400	970	410	450	330
15	885	3,980	1,300	900	410	450	330
16	820	3,350	1,300	835	410	450	330
17	700	3,550	1,210	835	410	450	330
18	700	3,350	1,210	770	410	450	330
19	645	3,350	1,130	710	410	410	330
20	645	3,160	1,130	655	410	410	330
21	645	2,980	1,210	655	410	410	330
22	700	2,980	1,130	655	450	410	330
23	820	2,650	1,050	600	450	410	290
24	1,480	2,350	1,050	600	450	410	290
25	1,660	2,500	1,130	550	410	410	290
26	2,950	2,210	1,130	550	410	410	290
27	3,800	2,210	1,300	550	410	450	290
28	4,350	2,070	1,130	550	410	450	290
29	4,650	2,350	1,050	550	410	410	290
30	3,760	2,070	2,070	655	410	410	290
31	4,420	.....	1,600	710	.....	370	.....

NOTE.—Discharge determined as follows: May 1–25, from a fairly well-defined rating curve; May 26–29, by indirect method for shifting channels; May 30 to Nov. 30, from a fairly well-defined rating curve. Discharge interpolated Oct. 16.

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Monthly discharge of Boulder River near McLeod, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May	4,650	360	1,380	84,800	B.
June	4,880	2,070	3,470	206,000	B.
July	2,500	1,060	1,630	100,000	B.
August	1,500	550	888	54,600	B.
September	600	410	442	26,300	B.
October	450	370	422	25,900	B.
November	370	290	330	19,600	B.
The period				517,000	

WEST FORK OF BOULDER RIVER AT McLEOD, MONT.

Location.—In the SE. ¼ sec. 16, T. 2 S., R. 13 E., at Koozer's private bridge, 200 yards upstream from highway bridge at McLeod post office.

Records available.—May 4, 1907, to December 31, 1913.

Drainage area.—137 square miles.

Gage.—Staff, fastened to piling of bridge near right bank.

Control.—Composed of bowlders; rough but practically permanent.

Discharge measurements.—Made from bridge or by wading.

Winter flow.—Affected by ice.

Diversions.—Water to irrigate about 800 acres of land is diverted above station. A Carey Act project reclaiming 12,000 to 15,000 acres is now under investigation; the water is to be diverted from the West Fork about 12 miles above the station.

Accuracy.—Open-water records good.

Discharge measurements of West Fork of Boulder River at McLeod, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Rate.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 21	W. A. Lamb	a 3.08	41	June 26	R. R. Randell	2.76	463
Apr. 29	R. R. Randell	2.04	157	Aug. 24	C. S. Heidel	1.75	199
May 29	do	3.51	906				

a Ice present.

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Daily gage height, in feet, of West Fork of Boulder River at McLeod, Mont., for 1913.

[C. C. Nicholson, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	1.9	3.5	2.9	2.4	1.8	1.7	1.7
2	.....	1.8	3.6	3.0	2.2	1.8	1.7	1.7
3	.....	1.9	3.6	2.8	2.2	1.8	1.7	1.7
4	.....	1.8	3.6	2.8	2.3	1.7	1.7	1.7
5	.....	1.9	3.5	2.8	2.3	1.7	1.7	1.7
6	.....	1.8	3.5	2.9	2.2	1.7	1.7	1.7
7	.....	1.9	3.7	2.9	2.2	1.7	1.7	1.7
8	.....	2.5	3.7	2.9	2.2	1.7	1.7	1.7
9	.....	2.6	3.5	2.8	2.6	1.7	1.7	1.7
10	.....	2.7	3.6	2.8	2.3	1.6	1.7	1.7
11	.....	2.6	3.6	2.7	2.2	1.6	1.8	1.7
12	.....	2.5	3.5	2.6	2.2	1.6	1.8	1.6
13	1.8	2.5	3.6	2.5	2.1	1.6	1.8	1.6
14	1.8	2.4	3.4	2.5	2.1	1.6	1.8	1.6
15	1.8	2.4	3.5	2.4	2.0	1.6	1.8	1.6
16	1.8	2.3	3.3	2.3	1.9	1.6	1.8	1.6
17	2.0	2.3	3.4	2.2	1.9	1.6	1.8	1.6
18	2.0	2.4	3.4	2.2	1.9	1.6	1.8	1.6
19	1.8	2.3	3.3	2.2	1.9	1.6	1.7	1.6
20	1.8	2.3	3.3	2.2	1.8	1.6	1.7	1.6
21	2.0	2.4	3.2	2.2	1.8	1.6	1.7	1.6
22	2.0	2.5	3.0	2.2	1.7	1.7	1.7	1.6
23	2.2	2.9	3.0	2.2	1.7	1.7	1.7	1.6
24	2.2	3.1	3.1	2.2	1.7	1.7	1.7	1.6
25	2.1	3.2	2.9	2.2	1.7	1.7	1.7	1.6
26	2.1	3.9	2.75	2.2	1.7	1.7	1.7	1.6
27	2.0	4.1	2.7	2.3	1.7	1.7	1.7	1.6
28	1.9	4.2	2.6	2.2	1.7	1.7	1.7	1.6
29	2.1	4.1	2.7	2.1	1.7	1.7	1.7	1.6
30	2.0	3.9	2.7	3.0	1.9	1.7	1.7	1.6
31	.....	4.0	.....	2.6	1.9	.....	1.7	.....

Daily discharge, in second-feet, of West Fork of Boulder River at McLeod, Mont., for 1913

	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	130	920	535	285	105	85	85
2	.....	105	990	595	210	105	85	85
3	.....	130	990	480	210	105	85	85
4	.....	105	990	480	245	85	85	85
5	.....	130	920	480	245	85	85	85
6	.....	105	920	535	210	85	85	85
7	.....	130	1,060	535	210	85	85	85
8	.....	330	1,060	535	210	85	85	85
9	.....	375	920	480	375	85	85	85
10	.....	425	990	480	245	70	85	85
11	.....	375	990	425	210	70	105	85
12	.....	330	920	375	210	70	105	70
13	105	230	990	330	180	70	105	70
14	105	285	850	330	180	70	105	70
15	105	285	920	285	155	70	105	70
16	105	245	785	245	130	70	105	70
17	155	245	850	210	130	70	105	70
18	155	285	850	210	130	70	105	70
19	105	245	785	210	130	70	85	70
20	105	245	785	210	105	70	85	70
21	155	285	720	210	105	70	85	70
22	155	330	595	210	85	85	85	70
23	210	535	595	210	85	85	85	70
24	210	655	655	210	85	85	85	70
25	180	720	535	210	85	85	85	70
26	180	1,200	452	210	85	85	85	70
27	155	1,340	425	245	85	85	85	70
28	130	1,420	375	210	85	85	85	70
29	180	1,340	425	180	85	85	85	70
30	155	1,200	425	595	130	85	85	70
31	.....	1,270	.....	375	130	.....	85	.....

NOTE.—Discharge determined from a well-defined rating curve.

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Monthly discharge of West Fork of Boulder River at McLeod, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 13-30	210	105	147	5,250	A.
May	1,420	105	488	30,000	B.
June	1,060	375	790	47,000	A.
July	595	180	349	21,500	A.
August	375	85	163	10,000	A.
September	105	70	81.0	4,820	A.
October	105	85	90.2	5,560	A.
November	85	70	75.5	4,490	A.
The period				129,000	

NOTE.—Accuracy for May reduced because hydrographer did not check observer's gage reading for May 29.

SWEETGRASS CREEK BELOW MELVILLE, MONT.

Location.—At McAllister's ranch, just above head of the canal owned by the Glass Lindsay Land Co.

Records available.—May 4, 1907 (at Adam's ranch site), to April 1, 1909; new site April 1, 1909, to December 31, 1913.

Drainage area.—137 square miles (measured on topographic sheets).

Gage.—Staff on left bank near observer's house.

Control.—Bed composed of clean gravel; shifting.

Discharge measurements.—Made by wading.

Winter flow.—Affected by ice.

Diversions and storage.—Many diversions made from this stream. All the low-water flow is appropriated, 550 second-feet being held by adjudicated rights. The Glass-Lindsay canal will carry 575 second-feet and irrigate 30,000 acres; the canal will divert water into two storage reservoirs, with capacities of 12,000 and 6,000 feet, respectively, which will be filled from the spring run-off.

Accuracy.—Records good.

Discharge measurements of Sweetgrass Creek below Melville, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 25	R. R. Randell	0.93	33
May 27	....do	2.74	664
June 24	....do	2.39	392
Aug. 21	C. S. Heidel	1.20	30.3

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Daily gage height, in feet, of Sweetgrass Creek below Melville, Mont., for 1913.

[Alexander Morgan and Robert Donald, observers.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	0.85	.....	2.4	1.61	1.09	1.55	1.75	1.6
2	.....	.85	.....	2.5	1.63	1.0	1.55	1.7	1.6
3	.....	.85	.....	2.25	1.60	1.0	1.52	1.7	1.6
4	.....	.85	.....	2.35	1.55	1.0	1.60	1.65	.....
5	.....	.85	.....	2.25	1.61	1.04	1.65	1.65	.....
6	.....	.85	.....	2.25	1.61	1.0	1.7	1.70	.....
7	.....	.85	.....	2.2	1.62	1.14	1.65	1.72	.....
8	.....	.9	.....	2.2	1.65	1.2	1.65	1.62	.....
9	.....	1.1	.....	2.1	1.7	1.2	1.65	1.60	.....
10	1.7	1.1	.....	2.1	1.61	1.2	1.65	1.61	.....
11	1.3	1.1	.....	2.1	1.60	1.28	1.72	1.61	.....
12	1.1	1.2	.....	2.0	1.60	1.38	1.82	1.62	.....
13	1.1	1.3	.....	1.85	1.60	1.32	1.82	1.65	.....
14	1.2	1.6	.....	1.85	1.5	1.32	1.75	1.62	.....
15	1.1	1.5	.....	1.7	1.5	1.3	1.70	1.60	.....
16	.9	1.4	.....	1.7	1.48	1.42	1.68	1.6	.....
17	1.1	1.6	.....	1.61	1.48	1.32	1.65	1.6	.....
18	1.0	1.7	.....	1.6	1.45	1.35	1.65	1.6	.....
19	.95	1.8	.....	1.61	1.32	1.32	1.65	1.6	.....
20	1.0	1.7	.....	1.61	1.18	1.35	1.65	1.6	.....
21	1.1	1.6	.....	1.11	1.12	1.35	1.65	1.55	.....
22	.95	1.5	.....	1.24	1.05	1.38	1.6	1.55	.....
23	.9	1.6	.....	1.45	1.0	1.4	1.62	1.6	.....
24	1.0	1.7	2.39	1.52	.....	1.4	1.65	1.65	.....
25	.9	1.95	2.28	1.55	1.0	1.4	1.70	1.6	.....
26	.9	2.15	2.3	1.62	1.04	1.45	1.72	1.6	.....
27	.9	2.8	3.0	1.63	.....	1.52	1.72	1.62	.....
28	.9	3.2	2.5	1.61	1.04	1.65	1.62	1.62	.....
29	.85	.....	2.55	1.61	1.0	1.6	1.70	1.62	.....
30	.85	.....	2.6	1.60	1.1	1.55	1.82	1.6	.....
31	.....	.....	.....	1.65	1.1	.....	1.78	.....	.....

Daily discharge, in second-feet, of Sweetgrass Creek below Melville, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	25	490	310	72	13	62	98	70
2	.....	25	540	354	75	10	62	88	70
3	.....	25	460	248	70	10	55	88	70
4	.....	25	410	280	62	10	70	79	.....
5	.....	25	410	248	72	11	79	79	.....
6	.....	25	460	248	72	10	88	88	.....
7	.....	25	340	229	74	15	79	92	.....
8	.....	30	460	229	79	19	79	74	.....
9	.....	52	460	193	88	19	79	70	.....
10	190	52	490	193	72	19	79	72	.....
11	85	52	1,190	193	70	26	92	72	.....
12	52	67	780	161	70	38	114	74	.....
13	52	85	680	121	70	30	114	79	.....
14	67	158	730	121	54	30	98	74	.....
15	52	130	650	88	54	28	88	70	.....
16	30	106	610	88	51	43	84	70	.....
17	52	158	570	72	51	30	79	70	.....
18	40	190	500	70	47	34	79	70	.....
19	35	225	520	72	30	30	79	70	.....
20	40	190	380	72	18	34	79	70	.....
21	52	158	240	14	14	34	79	62	.....
22	35	130	360	23	12	38	70	62	.....
23	30	158	350	47	10	40	74	70	.....
24	40	190	306	57	10	40	79	79	.....
25	30	284	260	62	10	40	88	70	.....
26	30	370	268	74	11	47	92	70	.....
27	30	706	604	75	11	55	92	74	.....
28	30	940	354	72	11	79	74	74	.....
29	25	630	377	72	10	70	88	74	.....
30	25	410	400	70	13	62	114	70	.....
31	.....	410	.....	79	13	.....	105	.....	.....

NOTE.—Discharge determined as follows: Apr. 10 to May 28, from a poorly defined rating curve; May 29 to June 23, estimated from the flow of Big Timber Creek near Big Timber; June 24 to Dec. 3, from a poorly defined rating curve. Discharge interpolated for days for which gage heights are missing.

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Monthly discharge of Sweetgrass Creek below Melville, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 10–30	190	25	48.7	2,030	C.
May	940	25	195	12,000	C.
June			488	29,000	D.
July	354	14	137	8,420	C.
August	88	10	44.4	2,730	C.
September	79	10	32.1	1,910	C.
October	114	55	83.6	5,140	C.
November	98	62	75.1	4,470	C.
The period				65,700	

STILLWATER RIVER NEAR NYE, MONT.

Location.—In the W. ½ SW. ¼ sec. 28, T. 5 S., R. 15 E., directly back of B. F. Wood's ranch, 1 mile below Woodbine Creek, 7 miles from the junction of the West Fork, and about 7 miles southwest of Nye.

Records available.—One discharge measurement each in 1911, 1912, and 1913, and gage heights for 1912 and 1913.

Drainage area.—187 square miles.

Gage.—Standard overhanging chain.

Control.—Rock; probably permanent.

Discharge measurements.—Made by wading or from cable.

Winter flow.—Affected by ice.

Diversion.—None of importance.

The following discharge measurement was made by R. R. Randell:

May 17, 1913.—Gage height, 4.16 feet; discharge, 321 second-feet.

Daily gage height, in feet, of Stillwater River near Nye, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		3.85	6.6	6.0		4.4			
2		3.85	6.6	5.8					
3		3.85	6.6	5.8					
4		3.95	6.4	5.8					
5		3.9	6.4	5.8					
6	2.95	4.05	6.5	6.0		4.2			
7	2.95	4.15	6.5	6.2					
8	2.95	4.35	6.6	6.0					
9	2.95	4.45	6.5	6.0					3.4
10	2.90	4.4	6.4	5.9					
11	2.95	4.55	6.4	5.7					
12	2.95	4.45	6.3	5.2					
13	2.95	4.45	6.3	5.3					
14	2.95	4.25	6.4	5.3		4.0			
15	3.1	4.2	6.5	5.2					
16	3.25	4.25	6.5	5.1					
17	3.45	4.2	6.4	5.2	5.0				
18	3.55	4.2	6.3	5.1					
19	3.65	4.1	6.3	5.0					
20	3.6	4.0	6.4	5.0					
21	3.55	4.0	6.5	5.0					
22	3.55	4.1	6.5	5.6					
23	3.55	4.3	6.6	5.1					
24	3.55	5.3	6.4	5.0					
25	3.6	5.5	6.0	4.9					
26	3.65	5.8	5.8	4.9					
27	3.65	6.3	5.7	4.9					
28	3.65	6.4	5.8	4.9	4.2				
29	3.75	6.4	5.7	5.7					
30	3.8	6.0	5.6	5.7		3.8	3.6		
31		6.4		5.6					

NOTE.—Discharge measurements insufficient to define rating curve.

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STILLWATER RIVER NEAR ABSAROKEE, MONT.

Location.—In the SE. ¼ SE. ¼ sec. 30, T. 35 E., R. 19 E., at the public highway bridge crossing stream at the Riverside road house, 13 miles southwest of Columbus, Mont., and about 1 mile northeast of Absarokee, Mont., below mouth of Rosebud River.

Records available.—July 19, 1910, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff gage nailed to right abutment on upstream side of bridge.

Control.—Likely to shift slightly in high water. Bed of stream composed of gravel and bowlders.

Discharge measurements.—Made from lower side of the bridge.

Winter flow.—Affected by ice.

Diversions.—The territory bordering Stillwater River is well irrigated by water taken from the river.

Discharge measurements of Stillwater River near Absarokee, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 24	R. R. Randell	0.87	549
July 8	.....do	4.41	4,440

Daily gage height, in feet, of Stillwater River near Absarokee, Mont., for 1913.

[S. A. Leaverton, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	0.55	1.05	5.4	3.5	3.3	2.2	1.05	0.75	0.55
2	.....	.3	1.05	5.5	3.6	3.2	2.2	1.05	1.0	.40
3	.....	.15	.9	5.5	4.0	3.1	2.2	1.0	.95	.....
4	.....	.1	.95	5.3	3.9	3.1	2.1	1.05	.75	.....
5	.....	.55	.95	5.1	4.1	3.1	2.0	1.25	1.1	.....
6	.....	.55	.9	5.2	4.0	3.0	1.9	1.1	1.05	.....
7	.....	.6	.7	5.0	4.1	2.9	1.9	1.05	1.05	.....
8	.....	.45	.95	5.0	4.5	2.9	1.75	1.05	1.0	.....
9	.....	.4	1.25	5.2	4.2	3.4	1.75	1.1	1.05	.....
10	.....	.25	1.5	4.8	4.1	3.6	1.8	1.15	.95	.....
11	.....	.4	1.85	4.6	4.2	3.3	1.75	1.15	.90	.....
12	.....	.6	1.85	4.2	3.6	3.0	1.75	1.2	1.05	.....
13	.....	.55	1.9	4.3	3.2	3.0	1.7	1.25	.90	.....
14	.....	.7	1.95	4.1	3.1	3.0	1.45	1.15	.80	.....
15	.....	.65	1.75	5.2	2.9	2.9	1.55	1.05	.75	.....
16	.....	.65	1.7	4.8	2.7	2.7	1.5	1.05	.95	.....
17	.....	.7	1.55	4.6	2.8	2.7	1.45	1.05	.75	.....
18	.....	.65	1.65	4.5	2.7	2.4	1.25	1.0	.60	.....
19	.....	.8	1.7	4.7	2.8	2.4	1.2	.95	.65	.....
20	.....	.95	1.65	4.9	2.9	2.4	1.15	.75	.70	.....
21	.....	.95	1.65	4.7	2.8	2.2	1.15	.75	.65	.....
22	.....	.95	1.5	4.5	3.0	2.2	1.3	.80	.60	.....
23	.....	.9	1.55	4.6	3.4	2.3	1.25	.75	.55	.....
24	.....	.7	2.0	4.4	3.1	2.1	1.25	.80	.60	.....
25	.....	.55	3.2	4.1	2.9	2.0	1.2	1.0	.65	.....
26	.....	.55	3.6	3.9	3.4	2.1	1.25	.80	.70	.....
27	.....	.6	4.5	3.7	3.4	2.1	1.15	.75	.50	.....
28	.....	.55	5.1	3.8	3.3	2.1	1.1	.95	.60	.....
29	.....	1.05	5.3	3.6	3.1	2.3	1.15	.95	.45	.....
30	.....	1.05	4.6	3.6	4.1	2.2	1.05	.90	.70	.....
31	1.05	.....	4.8	.....	3.8	2.1	.....	.95	.....	.....

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Daily discharge, in second-feet, of Stillwater River near Absarokee, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		375	625	5,920	3,000	2,720	1,400	625	475	375
2		260	625	6,080	3,140	2,580	1,400	625	600	308
3		215	550	6,080	3,720	2,450	1,400	600	575	.....
4		200	575	5,760	3,570	2,450	1,310	625	475	.....
5		375	575	5,440	3,870	2,450	1,220	730	650	.....
6		375	550	5,600	3,720	2,320	1,140	650	625	.....
7		400	450	5,280	3,870	2,190	1,140	625	625	.....
8		325	575	5,280	4,480	2,190	1,040	625	600	.....
9		300	730	5,600	4,020	2,860	1,040	650	625	.....
10		245	880	4,960	3,870	3,140	1,070	675	575	.....
11		300	1,100	4,540	4,020	2,720	1,040	675	550	.....
12		400	1,100	4,020	3,140	2,320	1,040	700	625	.....
13		375	1,140	4,170	2,580	2,320	1,000	730	550	.....
14		450	1,180	3,870	2,450	2,320	850	675	500	.....
15		425	1,040	5,600	2,190	2,190	910	625	475	.....
16		425	1,000	4,980	1,950	1,950	880	625	575	.....
17		450	910	4,540	2,070	1,950	850	625	475	.....
18		425	970	4,480	1,950	1,610	730	600	400	.....
19		500	1,000	4,800	2,070	1,610	700	575	425	.....
20		575	970	5,120	2,190	1,610	675	475	450	.....
21		575	970	4,800	2,070	1,400	675	475	425	.....
22		575	880	4,480	2,320	1,400	760	500	400	.....
23		550	910	4,540	2,860	1,500	730	475	375	.....
24		450	1,220	4,320	2,450	1,310	730	500	400	.....
25		375	2,580	3,870	2,190	1,220	700	600	425	.....
26		375	3,140	3,570	2,860	1,310	730	500	450	.....
27		400	4,480	3,280	2,860	1,310	675	475	350	.....
28		375	5,440	3,420	2,720	1,310	650	575	400	.....
29		625	5,760	3,140	2,450	1,500	675	575	325	.....
30		625	4,540	3,140	3,870	1,400	625	550	450	.....
31	625	.....	4,960	.....	3,420	1,310	.....	575	.....	.....

NOTE.—Discharge determined from a fairly well defined rating curve.

Monthly discharge of Stillwater River near Absarokee, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	625	200	411	24,500	B.
May	5,760	450	1,660	102,000	B.
June	6,080	3,140	4,690	279,000	B.
July	4,480	1,950	2,970	183,000	B.
August	3,140	1,220	1,970	121,000	B.
September	1,400	625	928	55,100	B.
October	730	475	598	36,800	B.
November	650	325	495	29,500	B.
The period	.....	.....	.....	831,000	

WOODBINE CREEK NEAR NYE, MONT.

Location.—Seven miles south of Nye, Mont., in the SE. ¼ sec. 32, T. 5 S., R. 15 E., approximately a quarter of a mile from the junction of this creek and Stillwater River.

Records available.—Two measurements in 1911, one each in 1912 and 1913, and scattering gage heights for 1912 and 1913.

Gage.—Sloping staff.

Control.—Large rocks; very rough.

Discharge measurements.—Made by wading.

Winter flow.—Affected by ice.

Diversion.—None.

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Measurements are made at this station to determine the amount of water available for power. In the first mile from its mouth the creek has a fall of 900 feet, and there is at present an application for development of its power.

The following measurement was made by R. R. Randell:

May 16, 1913.—Gage height, 2.63 feet; discharge, 16.6 second-feet.

Daily gage height, in feet, of Woodbine Creek near Nye, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Day.	Apr.	May.	June.	July.	Aug.	Sept.
1						3.05	16		2.65				
2							17					3.25	
3				3.75			18				3.25		
4		3.35					19			4.35			
5			4.55				20	2.45					
6	1.65						21		2.35				
7							22						
8							23						
9							24		3.55		3.25		
10				3.55			25						
11							26			3.75			
12			4.35				27	2.95					
13	2.05						28					3.05	
14							29		4.25				
15							30				3.45		
							31						

NOTE.—Measurements insufficient to define a rating curve.

ROSEBUD RIVER AT ABSAROKEE, MONT.

Location.—In the SE. ¼ sec. 36, T. 3 S., R. 18 W., at highway bridge just west of Absarokee, Mont., and 14 miles from Columbus, about 1 mile above Stillwater River.

Records available.—July 19, 1910, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Staff on downstream side of left abutment pier.

Control.—Not likely to shift. Bed of stream is composed of gravel and bowlders.

Discharge measurements.—Made from the downstream side of the bridge.

Winter flow.—Affected by ice.

Diversions.—Water for irrigation is diverted above the station.

Accuracy.—Conditions for obtaining accurate discharge data good.

Discharge measurements of Rosebud River at Absarokee, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 24	R. R. Randell	2.11	219
May 14	....do	2.50	445

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Daily gage height, in feet, of Rosebud River at Absarokee, Mont., for 1913.

[Fred Brunckhorst, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2.0	2.25	3.55	3.15	3.35	2.85	2.35	2.15	2.15
2	.....	1.95	2.25	3.65	3.25	3.3	2.85	2.3	2.15	2.15
3	.....	1.95	2.15	3.55	3.25	3.25	2.8	2.25	2.15	2.15
4	.....	2.05	2.25	3.55	3.25	3.25	2.75	2.3	2.1	2.1
5	.....	2.2	2.15	3.5	3.25	3.15	2.7	2.25	2.15	2.15
6	.....	2.15	2.25	3.55	3.35	3.2	2.75	2.3	2.15	2.15
7	.....	2.15	2.2	3.55	3.35	3.15	2.75	2.35	2.15	.....
8	.....	2.05	2.25	3.55	3.55	3.15	2.75	2.35	2.15	.....
9	.....	2.15	2.35	3.55	3.55	3.45	2.75	2.35	2.1	.....
10	.....	2.1	2.35	3.45	3.5	3.3	2.7	2.3	2.15	.....
11	.....	2.25	2.55	3.45	3.55	3.25	2.7	2.3	2.15	.....
12	.....	2.25	2.75	3.75	3.35	3.25	2.7	2.3	2.15	.....
13	.....	2.25	2.65	3.55	3.15	3.25	2.7	2.3	2.25	.....
14	.....	2.35	2.6	3.5	3.05	3.2	2.65	2.25	2.2	.....
15	.....	2.2	2.6	3.5	2.95	3.1	2.55	2.2	2.15	.....
16	.....	2.15	2.55	3.45	2.95	3.15	2.55	2.25	2.15	.....
17	.....	2.15	2.5	3.45	2.95	3.15	2.55	2.25	2.15	.....
18	.....	2.25	2.6	3.45	2.95	3.05	2.5	2.25	2.15	.....
19	.....	2.15	2.55	3.45	3.05	2.95	2.5	2.25	2.1	.....
20	.....	2.1	2.4	3.5	3.05	2.9	2.4	2.2	2.15	.....
21	.....	2.25	2.45	3.55	3.15	2.85	2.4	2.25	2.15	.....
22	.....	2.25	2.45	3.45	3.35	2.85	2.4	2.25	2.15	.....
23	.....	2.15	2.45	3.45	3.4	2.8	2.4	2.2	2.15	.....
24	.....	2.1	2.55	3.45	3.35	2.75	2.45	2.2	2.1	.....
25	.....	2.1	2.9	3.4	3.4	2.7	2.45	2.15	2.15	.....
26	.....	2.05	3.15	3.35	3.45	2.75	2.45	2.2	2.15	.....
27	.....	2.1	3.45	3.25	3.45	2.75	2.45	2.15	2.15	.....
28	.....	2.15	3.55	3.25	3.35	2.75	2.4	2.15	2.15	.....
29	.....	2.2	3.45	3.25	3.45	2.75	2.4	2.15	2.1	.....
30	2.45	2.1	3.35	3.2	3.4	2.7	2.3	2.1	2.15	.....
31	2.25	.....	3.45	.....	3.45	2.75	.....	2.15	.....	.....

Daily discharge, in second-feet, of Rosebud River at Absarokee, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	190	280	1,550	990	1,250	675	325	242	242
2	175	280	1,720	1,120	1,180	675	300	242	242
3	175	242	1,550	1,120	1,120	630	280	242	242
4	208	280	1,550	1,120	1,120	590	300	225	225
5	260	242	1,470	1,120	990	550	280	242	242
6	242	280	1,550	1,250	1,050	590	300	242	242
7	242	260	1,550	1,250	990	590	325	242	.....
8	208	280	1,550	1,550	990	590	325	242	.....
9	242	325	1,550	1,550	1,400	590	325	225	.....
10	225	325	1,400	1,470	1,180	550	300	242	.....
11	280	445	1,400	1,550	1,120	550	300	242	.....
12	280	590	1,880	1,250	1,120	550	300	242	.....
13	280	515	1,550	990	1,200	550	300	280	.....
14	325	480	1,470	875	1,050	515	280	260	.....
15	260	480	1,470	770	930	445	260	242	.....
16	242	445	1,400	770	990	445	280	242	.....
17	242	410	1,400	770	990	445	280	242	.....
18	280	480	1,400	770	875	410	280	242	.....
19	242	445	1,400	875	770	410	280	225	.....
20	225	350	1,470	875	720	350	260	242	.....
21	280	380	1,550	990	675	350	280	242	.....
22	280	380	1,400	1,250	675	350	280	242	.....
23	242	380	1,400	1,320	630	350	260	242	.....
24	225	445	1,400	1,250	590	380	260	225	.....
25	225	720	1,320	1,320	550	380	242	242	.....
26	208	990	1,250	1,400	590	380	260	242	.....
27	225	1,400	1,120	1,400	590	380	242	242	.....
28	242	1,550	1,120	1,250	590	350	242	242	.....
29	260	1,400	1,120	1,400	590	350	242	225	.....
30	225	1,250	1,050	1,320	550	300	225	242	.....
31	.....	1,400	.....	1,400	590	.....	242	.....	.....

NOTE.—Discharge determined from a fairly well-defined rating curve.

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Monthly discharge of Rosebud River at Absarokee, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	325	175	241	14,300	B.
May	1,550	242	572	35,200	B.
June	1,880	1,050	1,430	85,100	B.
July	1,550	770	1,170	71,900	B.
August	1,400	550	890	54,700	B.
September	675	300	476	28,300	B.
October	325	225	279	17,200	B.
November	280	225	241	14,300	B.
December 1-6	242	225	239	2,840	B.
The period				324,000	

CLARK FORK AT FROMBERG, MONT.

Location.—In sec. 21, T. 5 S., R. 23 E., at highway bridge half a mile east of Northern Pacific Railway station at Fromberg, Mont.

Records available.—June 3, 1905, to December 31, 1913.

Drainage area.—2,500 square miles.

Gage.—A standard chain fastened to upstream side of bridge.

Control.—Permanent. Bed of stream composed of rock and gravel; free from vegetation. Channel divided by middle pier of bridge.

Discharge measurements.—Made from bridge.

Winter flow.—Affected by ice from December to the middle of March.

Diversions.—Many diversions are made from the river, but only a small part of the total flow is used.

Accuracy.—Records excellent.

No discharge measurements were made during 1913.

Daily gage height, in feet, of Clark Fork at Fromberg, Mont., for 1913.

[Mrs. E. V. Moran, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		3.6	3.5	8.0	6.3	5.5	4.3	3.6	3.7	3.6
2		3.6	3.5	8.2	6.2	5.5	4.3	3.5	3.7	3.6
3		3.5	3.5	8.2	6.2	5.5	4.2	3.5	3.7	3.6
4		3.5	3.5	8.3	6.0	5.5	4.2	3.5	3.65	3.6
5		3.5	3.5	8.6	6.0	5.5	4.2	3.5	3.6	3.6
6		3.5	3.3	8.3	6.0	5.5	4.2	3.7	3.6	3.6
7		3.5	3.5	8.2	6.0	5.5	4.2	3.6	3.6	3.6
8		3.5	3.5	8.1	6.3	5.4	4.2	3.6	3.5	3.6
9		3.5	3.5	8.0	6.2	5.4	4.0	3.6	3.5	3.6
10		3.5	3.5	7.9	6.0	5.4	4.0	3.6	3.5	3.6
11		3.5	3.7	7.8	6.0	5.4	4.0	3.5	3.5	3.6
12		3.5	3.7	8.1	5.9	5.5	4.0	3.5	3.55	3.6
13		3.7	3.7	8.0	5.9	5.5	4.0	3.5	3.55	3.7
14		3.7	3.7	8.0	5.9	5.5	4.0	3.5	3.55	3.65
15		3.7	3.9	7.8	5.9	5.5	4.0	3.7	3.55	3.7
16	3.5	3.7	4.0	7.7	5.9	5.4	4.0	3.7	3.5	3.6
17	3.5	3.9	4.0	7.6	5.8	5.3	3.9	3.7	3.5	3.7
18	3.5	3.9	4.1	8.7	5.9	5.3	3.9	3.7	3.5	3.7
19	3.5	3.9	4.15	8.6	6.0	5.3	3.9	3.7	3.5	3.7
20	3.5	3.9	4.2	7.8	5.9	5.3	3.9	3.7	3.5	3.7
21	3.5	3.9	4.3	7.7	5.9	5.3	3.9	3.65	3.5	3.7
22	3.5	3.85	4.4	7.6	5.9	5.3	3.9	3.6	3.5	3.6
23	3.5	3.8	4.85	7.3	5.9	5.3	4.8	3.6	3.5	3.6
24	3.5	3.75	5.4	7.2	5.7	5.3	4.8	3.6	3.5	3.6
25	3.5	3.7	5.6	7.0	5.7	5.2	4.8	3.6	3.5	3.6
26	3.5	3.7	6.4	7.0	5.6	5.2	4.8	3.6	3.5	3.6
27	3.5	3.65	7.3	6.8	5.6	5.1	3.8	3.65	3.5	3.6
28	3.5	3.6	8.1	6.7	5.6	4.9	3.7	3.7	3.5	3.6
29	3.8	3.6	8.0	6.5	5.6	4.7	3.65	3.7	3.5	3.6
30	3.85	3.6	8.0	6.4	5.8	4.5	3.6	3.6	3.7	3.6
31	3.85		7.8		5.8	4.5		3.6		3.6

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Daily discharge, in second-feet, of Clark Fork at Fromberg, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		375	325	7,030	3,360	2,160	860	375	430	375
2		375	325	7,620	3,180	2,160	860	325	430	375
3		325	325	7,620	3,180	2,160	780	325	430	375
4		325	325	7,910	2,860	2,160	780	325	402	375
5		325	325	8,810	2,860	2,160	780	325	375	375
6		325	325	7,910	2,860	2,160	780	430	375	375
7		325	325	7,620	2,860	2,160	780	375	375	375
8		325	325	7,330	3,360	2,040	780	375	325	375
9		325	325	7,030	3,180	2,040	625	375	325	375
10		325	325	6,760	2,860	2,040	625	375	325	375
11		325	430	6,490	2,860	2,040	625	325	325	375
12		325	430	7,330	2,710	2,160	625	325	350	375
13		430	430	7,030	2,710	2,160	625	325	350	430
14		430	430	7,030	2,710	2,160	625	325	350	402
15		430	555	6,490	2,710	2,160	625	430	350	430
16	325	430	625	6,230	2,710	2,040	625	430	325	375
17	325	555	625	5,980	2,560	1,920	555	430	325	430
18	325	555	700	9,110	2,710	1,920	555	430	325	430
19	325	555	740	8,810	2,860	1,920	555	430	325	430
20	325	555	780	6,490	2,710	1,920	555	430	325	430
21	325	555	860	6,230	2,710	1,920	555	402	325	430
22	325	522	945	5,980	2,710	1,920	555	375	325	375
23	325	490	1,390	5,280	2,710	1,920	1,340	375	325	375
24	325	460	2,040	5,050	2,420	1,920	1,340	375	325	375
25	325	430	2,290	4,630	2,420	1,800	1,340	375	325	375
26	325	430	3,520	4,630	2,290	1,800	1,340	375	325	375
27	325	402	5,280	4,240	2,290	1,680	490	402	325	375
28	325	375	7,330	4,060	2,290	1,440	430	430	325	375
29	490	375	7,030	3,700	2,290	1,230	402	430	325	375
30	522	375	7,030	3,520	2,560	1,040	375	375	430	375
31	522	.....	6,490	.....	2,560	1,040	.....	375	.....	375

NOTE.—Discharge determined from a rating curve well defined by measurements made in 1910, 1911, and 1912.

Monthly discharge of Clark Fork at Fromberg, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 16–31	522	325	360	11,460	B.
April	555	325	412	24,500	B.
May	7,330	325	1,720	106,000	B.
June	9,110	3,520	6,460	384,000	B.
July	3,360	2,290	2,740	168,000	B.
August	2,160	1,040	1,910	117,000	B.
September	1,340	375	726	43,200	B.
October	430	325	380	23,400	B.
November	430	325	350	20,800	B.
December	430	375	388	23,900	C.
The period	.....	.....	.....	922,000	

NOTE.—Accuracy reduced from A to B because station was not visited during 1913. Accuracy for December reduced because of the possibility of some ice effect.

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PRYOR CREEK AT COBURN, MONT.

Location.—At the ranch of John A. Hoyt, at Coburn, Mont., in SE. ¼ sec. 35, T. 1 S., R. 27 E., on the Crow Indian Reservation.

Records available.—September 13, 1911, to December 31, 1913.

Gage.—Overhanging chain gage on left bank opposite farmhouse of John A. Hoyt.

Control.—Firm gravel and cobblestones; permanent. The bed of the stream at the gage is composed of gravel and sand. At low stages the water is deep and sluggish at the gage and for several hundred feet above and below.

Discharge measurement.—Made by wading above the gage.

Winter flow.—Channel blocked with ice during winter months.

Diversion.—Water sufficient to irrigate approximately 1,000 acres near Pryor is diverted about 30 miles above this station.

Discharge measurements of Pryor Creek at Coburn, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Apr. 16	R. R. Randell	4.74	102	Aug. 21	J. M. Ray	3.86	16.6
May 26	do	4.51	69	Oct. 11	do	4.53	73
July 7	do	3.86	16.2				

Daily gage height, in feet, of Pryor Creek at Coburn, Mont., for 1913.

[Harry Foster, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	4.7	4.5	4.2	3.8	3.6	4.05	4.35	4.15
2	.....	4.7	4.5	4.1	3.8	3.7	4.05	4.4	4.1
3	.....	4.6	4.5	4.05	3.8	3.7	4.05	4.4	.....
4	.....	4.6	4.5	4.0	3.8	3.7	4.1	4.3	.....
5	.....	4.6	4.5	3.95	3.7	3.7	4.15	4.2	.....
6	.....	4.6	4.5	3.9	3.8	3.1	4.6	4.2	.....
7	.....	4.5	4.6	3.8	3.8	3.7	4.6	4.2	.....
8	.....	4.5	4.6	3.8	3.8	3.8	4.8	4.2	.....
9	.....	4.5	4.5	3.8	3.8	3.9	4.8	4.15	.....
10	.....	4.5	4.5	3.8	4.1	3.8	4.9	4.15	.....
11	.....	4.5	4.5	3.9	4.0	3.9	4.5	4.3	.....
12	.....	4.5	4.5	3.9	4.0	3.8	4.15	4.2	.....
13	.....	4.5	4.5	3.85	3.9	3.9	4.15	4.15	.....
14	.....	4.5	4.4	3.8	3.9	3.9	4.1	4.1	.....
15	.....	4.5	4.3	3.9	3.9	3.9	4.0	4.15	.....
16	4.6	4.5	4.3	3.85	3.9	3.9	4.05	4.15	.....
17	4.6	4.5	4.2	3.8	3.9	3.9	4.05	4.1	.....
18	4.6	4.6	4.2	3.8	3.8	3.9	4.0	4.15	.....
19	4.6	4.9	4.2	3.8	3.9	3.9	4.05	4.15	.....
20	4.6	4.9	4.2	3.8	3.8	3.9	4.05	4.1	.....
21	4.6	4.7	4.15	3.7	3.9	3.9	4.05	4.15	.....
22	4.6	4.6	4.2	3.8	3.8	4.0	4.05	4.1	.....
23	4.8	4.6	4.15	3.8	3.7	4.1	4.1	4.1	.....
24	4.6	4.5	4.2	3.8	3.7	4.4	4.15	4.25	.....
25	4.6	4.5	4.2	3.8	3.7	4.7	4.35	4.35	.....
26	4.6	4.5	4.3	3.8	3.7	5.0	4.3	4.2	.....
27	4.6	4.5	4.4	3.8	3.7	4.9	4.3	4.15	.....
28	4.5	4.5	4.25	3.7	3.7	4.8	4.35	4.1	.....
29	4.6	4.5	4.25	3.8	3.7	4.2	4.35	4.1	.....
30	4.7	4.5	4.2	3.8	3.7	4.1	4.3	4.15	.....
31	.....	4.6	.....	3.9	3.7	.....	4.35	.....	.....

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Daily discharge, in second-feet, of Pryor Creek at Coburn, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	458	90	70	41	14	6	28	55	36
2	.....	206	90	70	32	14	10	28	60	32
3	.....	245	80	70	28	14	10	28	60	.....
4	.....	368	80	70	23	14	10	32	50	.....
5	.....	552	80	70	20	10	10	36	41	.....
6	.....	327	80	70	18	14	10	80	41	.....
7	.....	245	70	80	14	14	10	80	41	.....
8	.....	149	70	80	14	14	14	100	41	.....
9	.....	96	70	70	14	14	18	100	36	.....
10	.....	96	70	70	14	32	14	111	36	.....
11	.....	88	70	70	18	23	18	70	50	.....
12	.....	81	70	70	18	23	14	36	41	.....
13	.....	88	70	70	16	18	18	36	36	.....
14	.....	81	70	60	14	18	18	32	32	.....
15	.....	81	70	50	18	18	18	23	36	.....
16	.....	80	70	50	16	18	18	28	36	.....
17	.....	80	70	41	14	18	18	28	32	.....
18	.....	80	80	41	14	14	18	23	36	.....
19	.....	80	111	41	14	18	18	28	36	.....
20	.....	80	111	41	14	14	18	28	32	.....
21	.....	80	90	36	10	18	18	28	36	.....
22	.....	80	80	41	14	14	23	28	32	.....
23	.....	100	80	36	14	10	32	32	32	.....
24	.....	80	70	41	14	10	60	36	46	.....
25	.....	80	70	41	14	10	90	55	55	.....
26	.....	80	70	50	14	10	122	50	41	.....
27	.....	80	70	60	14	10	111	50	36	.....
28	.....	70	70	46	10	10	100	55	32	.....
29	.....	80	70	46	14	10	41	55	32	.....
30	1,080	90	70	41	14	10	32	50	36	.....
31	770	.....	80	.....	18	10	.....	55	.....	.....

NOTE.—Discharge determined from a well-defined rating curve. Discharge Mar. 30 to Apr. 15 estimated from flood marks and discharge of Pryor Creek at Huntley.

Monthly discharge of Pryor Creek at Coburn, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	458	70	146	8,690	C.
May	111	70	77.2	4,750	A.
June	80	36	56.4	3,360	A.
July	41	10	16.9	1,040	A.
August	32	10	14.8	910	A.
September	122	6	30.6	1,820	A.
October	111	23	46.7	2,870	A.
November	60	32	40.2	2,390	A.
December	.....	.....	[a] 40	2,460	C.
The period	.....	.....	.....	28,300	

[a] Estimated from flow at Huntley.

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PRYOR CREEK AT HUNTLEY, MONT.

Location.—In the SW. ¼ sec. 25, T. 2 N., R. 27 E., at steel highway bridge, half a mile from railroad station at Huntley.

Records available.—August 6, 1904, to December 31, 1913.

Drainage area.—800 square miles.

Gage.—Chain, installed June 16, 1906, at highway bridge crossing the new channel, into which the creek was at that time turned by the United States Reclamation Service.

Control.—Bed composed of clay and gravel and may change somewhat; banks steep and uniformly graded, clean, and not subject to overflow; current moderate.

Discharge measurements.—Made from the bridge to which the gage is attached or by wading.

Winter flow.—Stream freezes over during winter months.

Discharge measurements of Pryor Creek at Huntley, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Mar. 18	W. A. Lamb.....	a 1.85	62	June 28	R. R. Randell.....	1.74	74
Apr. 23	R. R. Randall.....	1.91	102	Aug. 22	J. M. Ray.....	1.10	15.6
May 24	.....do.....	1.72	85	Oct. 3	.....do.....	1.48	36

a Ice present.

Daily gage height, in feet, of Pryor Creek at Huntley, Mont., for 1913.

[E. V. Carpenter, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1.....	1.95	1.9	2.1	5.2	.....	1.7	1.45	1.1	1.0	1.5	1.65	1.7
2.....	1.95	1.9	2.1	3.9	.....	1.65	1.35	1.1	1.05	1.45	1.7	1.70
3.....	1.95	2.0	2.1	2.7	.....	1.65	1.35	1.05	1.1	1.48	1.85	1.67
4.....	2.0	2.0	2.2	2.9	.....	1.65	1.25	1.0	1.1	1.50	1.75	1.65
5.....	2.2	2.0	2.05	3.5	.....	1.6	1.2	1.05	1.1	1.55	1.60	1.62
6.....	2.8	2.0	2.1	4.3	.....	1.65	1.2	1.0	1.1	1.6	1.62	1.62
7.....	2.6	1.9	2.8	3.3	.....	1.6	1.25	1.0	1.1	2.2	1.65	1.62
8.....	2.1	1.9	2.5	2.9	.....	1.6	1.2	1.0	1.1	2.0	1.62	1.55
9.....	2.1	2.0	2.4	2.35	.....	1.65	1.15	1.0	1.1	2.0	1.60	1.57
10.....	2.0	1.9	2.6	2.0	.....	1.6	1.1	1.45	1.1	2.4	1.6	1.60
11.....	2.0	1.95	2.4	2.0	.....	1.6	1.1	1.65	1.1	2.3	1.6	1.6
12.....	1.9	1.95	2.3	1.95	.....	1.5	1.15	1.35	1.1	2.0	1.6	1.6
13.....	1.9	1.95	2.2	1.9	.....	1.5	1.1	1.3	1.1	1.8	1.60	1.60
14.....	1.9	1.95	2.2	1.95	1.75	1.55	1.0	1.25	1.1	1.6	1.57	1.62
15.....	1.9	2.0	2.1	1.9	1.85	1.4	1.0	1.2	1.2	1.55	1.50	1.62
16.....	1.9	3.0	1.9	1.9	1.7	1.4	1.0	1.2	1.15	1.5	1.53	1.62
17.....	1.85	2.6	1.9	1.9	1.75	1.4	1.05	1.2	1.15	1.5	1.55	1.60
18.....	1.9	2.6	1.9	1.9	1.8	1.4	1.0	1.2	1.15	1.50	1.58	1.58
19.....	1.9	2.6	1.9	1.88	1.9	1.45	.95	1.2	1.15	1.47	1.60	1.56
20.....	1.9	2.5	1.9	1.95	2.05	1.4	.95	1.2	1.2	1.45	1.6	1.50
21.....	1.9	2.3	1.9	.....	1.85	1.55	.9	1.2	1.25	1.47	1.6	1.65
22.....	1.9	2.2	1.9	.....	2.0	1.4	.95	1.1	1.25	1.50	1.6	1.65
23.....	2.0	2.0	1.9	1.9	2.0	1.35	1.0	1.1	1.3	1.5	1.65	1.65
24.....	2.0	2.0	1.9	1.9	1.7	1.35	1.0	1.1	1.6	1.5	1.7	1.65
25.....	2.05	2.0	1.9	1.9	1.75	1.25	1.0	1.1	1.75	1.5	1.7	1.65
26.....	2.0	2.1	1.9	1.86	1.7	1.35	.95	1.1	2.1	1.7	1.70	1.65
27.....	2.0	2.1	2.0	1.85	1.7	1.35	.95	1.1	2.2	1.95	1.73	1.65
28.....	2.0	2.1	2.0	1.82	1.65	1.78	.95	1.05	2.2	1.7	1.65	1.7
29.....	2.0	.....	2.25	1.82	1.65	1.6	1.0	1.0	1.8	1.8	1.35	1.7
30.....	2.05	.....	4.0	1.8	1.7	1.5	1.15	1.0	1.5	1.9	1.55	1.7
31.....	2.0	.....	6.5	.....	1.65	.....	1.1	1.0	.....	1.7	.....	1.7

NOTE.—Jan. 1 to Mar. 28 gage heights affected by ice.

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Daily discharge, in second-feet, of Pryor Creek at Huntley, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	960	112	79	36	15	12	40	58	65
2	.....	572	112	68	28	15	14	36	65	65
3	.....	258	100	68	28	14	15	38	92	61
4	.....	306	100	68	22	12	15	40	74	58
5	.....	460	100	59	19	14	15	46	51	54
6	.....	690	100	67	19	12	15	51	54	54
7	.....	408	88	59	22	12	15	158	58	54
8	.....	306	88	58	19	12	15	120	54	46
9	.....	186	88	65	17	12	15	120	51	46
10	.....	120	88	58	15	36	15	196	51	51
11	.....	120	88	57	15	58	15	177	51	51
12	.....	110	88	44	17	28	15	120	51	51
13	.....	101	88	44	15	24	15	82	51	51
14	.....	110	96	49	12	22	15	51	48	54
15	.....	101	110	34	12	19	19	46	40	54
16	.....	101	82	34	12	19	17	40	43	54
17	.....	101	92	33	14	19	17	40	46	51
18	62	101	101	33	13	19	17	40	49	49
19	62	97	120	37	11	19	17	37	51	47
20	62	110	130	33	11	19	19	36	51	40
21	62	107	110	47	10	19	22	37	51	56
22	62	104	139	32	11	15	22	40	51	58
23	62	101	139	28	12	15	24	40	58	58
24	62	101	82	28	12	15	51	40	65	58
25	62	101	92	22	12	15	74	40	65	58
26	62	93	82	28	11	15	139	65	65	58
27	76	92	80	28	11	15	158	110	70	58
28	76	86	72	79	11	14	158	65	58	65
29	168	86	72	51	12	12	82	82	28	65
30	600	82	79	40	17	12	40	101	46	65
31	1,350	.....	70	.....	15	12	.....	65	.....	65

NOTE.—Discharge determined as follows: Mar. 29 to Apr. 30 and after June 27, from a fairly well defined rating curve; Mar. 19–28, estimated from measurement of Mar. 18 and gage heights; May 1–13, estimated from flow of Pryor Creek near Coburn; May 14 to June 27, by indirect method for shifting channels.

Monthly discharge of Pryor Creek at Huntley, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 18–31	1,350	62	202	5,610	C.
April	960	82	209	12,400	B.
May	139	70	96.4	5,930	C.
June	79	22	47.7	2,840	C.
July	36	10	15.8	972	B.
August	58	12	18.0	1,110	B.
September	158	12	36.1	2,150	B.
October	196	36	70.9	4,360	B.
November	92	28	54.9	3,270	B.
December	65	40	55.6	3,420	B.
The period	.....	.....	.....	42,100	

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BIGHORN RIVER NEAR HARDIN, MONT.

Location.—On the Crow Indian Reservation, in the SW. ¼ sec. 13, T. 1 S., R. 33 E., at the bridge of the Chicago, Burlington & Quincy Railroad about half a mile above junction of Bighorn and Little Bighorn rivers, 2 miles from Hardin, Mont.

Records available.—June 16, 1904, to December 31, 1913.

Drainage area.—20,700 square miles.

Gage.—A chain attached to west span of railroad bridge was read up to October 11, 1913. After that date a temporary staff gage, set to the datum of the chain gage but located 20 feet farther downstream, was read. The staff gage reads 0.07 lower than the chain, owing to its different location. Gage heights after October 11 have been corrected to chain-gage datum.

Control.—Composed of gravel; free from vegetation.

Discharge measurements.—Made from railroad bridge.

Winter flow.—Affected by ice.

Diversions.—Water is diverted a few miles above the station by a private irrigation company to irrigate land on west side of the river.

Discharge measurements of Bighorn River near Hardin, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 17	R. R. Randell	4.55	6,400
May 19	do	4.42	5,790
June 30	do	6.18	14,300
Aug. 23	J. M. Ray	3.40	3,090

Daily gage height, in feet, of Bighorn River near Hardin, Mont., for 1913.

[H. R. Kean, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	6.5	4.3	7.0	6.6	5.5	3.4	3.2	2.9
2	.....	6.9	4.4	7.2	6.6	5.2	3.5	3.15	2.95
3	.....	6.2	4.3	7.1	6.5	5.1	3.5	3.2	2.95
4	.....	5.3	4.2	6.8	6.2	5.0	3.5	3.1	3.1
5	.....	5.1	4.0	6.6	6.0	4.8	3.6	3.15	3.05
6	.....	4.7	3.9	6.5	5.9	4.9	3.5	3.2	3.1
7	.....	4.7	3.8	6.4	5.8	4.8	3.5	3.4	3.05
8	.....	4.4	3.6	6.4	5.8	4.6	3.4	3.45	3.1
9	.....	4.2	3.6	7.0	5.8	5.0	3.35	3.3	3.05
10	.....	3.3	4.0	6.8	5.8	4.7	3.3	3.2	3.0
11	.....	3.9	4.6	6.4	5.7	4.6	3.25	3.15	2.9
12	.....	3.7	4.9	6.3	5.7	4.5	3.25	3.1	2.9
13	.....	3.7	5.2	6.2	5.6	4.4	3.3	3.05	2.9
14	.....	3.9	5.1	6.2	5.4	4.2	3.3	3.1	2.95
15	4.8	4.0	5.0	6.0	5.2	4.1	3.3	3.05	2.9
16	5.3	4.4	4.9	5.8	5.0	3.95	3.3	3.1	2.85
17	5.3	4.5	4.6	5.6	4.7	3.85	3.25	3.05	2.85
18	5.1	4.7	4.4	5.6	4.6	3.75	3.25	3.1	2.9
19	5.1	4.8	4.4	5.8	4.4	3.7	3.2	3.05	2.85
20	5.0	5.0	4.4	5.8	4.4	3.65	3.15	3.1	2.9
21	5.0	5.0	4.4	5.6	4.4	3.5	3.1	3.05	2.85
22	5.0	5.0	4.4	5.6	4.3	3.45	3.1	3.05	2.9
23	5.1	4.8	4.6	5.8	4.3	3.4	3.1	3.05	.....
24	5.1	4.7	4.5	6.2	4.4	3.45	3.2	3.1	.....
25	5.1	4.4	4.7	6.3	4.8	3.35	3.4	3.05	.....
26	5.1	4.0	5.0	6.3	5.2	3.25	3.3	3.1	.....
27	5.1	3.9	5.5	6.0	5.6	3.2	3.3	3.05	.....
28	5.1	3.6	6.1	5.8	6.0	3.2	3.3	3.1	.....
29	5.1	3.7	6.6	5.8	6.0	3.15	3.2	3.05	.....
30	6.5	4.2	6.9	6.1	5.8	3.25	3.25	2.9	.....
31	6.9	.....	7.2	.....	5.6	3.45	.....	2.9	.....

NOTE.—Gage heights for March may be somewhat affected by ice. Gage height Apr. 10 probably erroneous.

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Daily discharge, in second-feet, of Bighorn River near Hardin, Mont., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	16,200	5,530	19,300	16,800	10,800	3,010	2,550	1,950
2	.....	18,600	5,860	20,600	16,800	9,230	3,250	2,440	2,040
3	.....	14,600	5,530	20,000	16,200	8,720	3,250	2,550	2,040
4	.....	9,750	5,210	18,000	14,600	8,230	3,250	2,340	2,340
5	.....	8,720	4,600	16,800	13,500	7,320	3,500	2,440	2,240
6	.....	6,920	4,310	16,200	12,900	7,760	3,250	2,550	2,340
7	.....	6,920	4,030	15,600	12,400	7,320	3,250	3,010	2,340
8	.....	5,860	3,500	15,600	12,400	6,550	3,010	3,130	2,340
9	.....	5,210	3,500	19,300	12,400	8,230	2,890	2,770	2,240
10	.....	5,530	4,600	18,000	12,400	6,920	2,770	2,550	2,140
11	.....	4,310	6,550	15,600	11,900	6,550	2,660	2,440	1,950
12	.....	3,760	7,760	15,100	11,900	6,200	2,660	2,340	1,950
13	.....	3,760	9,230	14,600	11,300	5,860	2,770	2,240	1,950
14	.....	4,310	8,720	14,600	10,300	5,210	2,770	2,340	2,040
15	7,320	4,600	8,230	13,500	9,230	4,900	2,770	2,340	1,950
16	9,750	5,860	7,760	12,400	8,230	4,460	2,770	2,340	1,860
17	9,750	6,200	6,550	11,300	6,920	4,170	2,660	2,240	1,860
18	8,720	6,920	5,860	11,300	6,550	3,900	2,660	2,340	1,950
19	8,720	7,320	5,860	12,400	5,860	3,760	2,550	2,240	1,860
20	8,230	8,230	5,860	12,400	5,860	3,630	2,440	2,340	1,950
21	8,230	8,230	5,860	11,300	5,860	3,250	2,340	2,240	1,860
22	8,230	8,230	5,860	11,300	5,530	3,130	2,340	2,240	1,920
23	8,720	7,320	6,550	12,400	5,530	3,010	2,340	2,240	.....
24	8,720	6,920	6,200	14,600	5,860	3,130	2,550	2,340	.....
25	8,720	5,860	6,920	15,100	7,320	2,890	3,010	2,240	.....
26	8,720	4,600	8,230	15,100	9,230	2,660	2,770	2,340	.....
27	8,720	4,310	10,800	13,500	11,300	2,550	2,770	2,240	.....
28	8,720	3,500	14,000	12,400	13,500	2,550	2,770	2,340	.....
29	8,720	3,760	16,800	12,400	13,500	2,440	2,550	2,240	.....
30	16,200	5,210	18,600	14,000	12,400	2,660	2,660	1,950	.....
31	18,600	.....	20,600	.....	11,300	3,130	.....	1,950	.....

NOTE.—Discharge determined from a fairly well defined rating curve. The gage heights for March may be affected by ice, in which case the results are high. Discharge estimated Apr. 10 because of probable error in gage height.

Monthly discharge of Bighorn River near Hardin, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 15-31	18,600	7,320	9,690	327,000	B.
April	18,600	3,500	7,050	420,000	B.
May	20,600	3,500	7,720	475,000	B.
June	20,600	11,300	14,800	881,000	B.
July	16,800	5,530	10,600	652,000	B.
August	10,800	2,440	5,200	320,000	B.
September	3,500	2,340	2,810	167,000	B.
October	3,130	1,950	2,380	146,000	B.
November 1-22	2,340	1,860	2,050	89,500	B.
The period	.....	.....	.....	3,480,000	

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SHOSHONE RIVER AT CORBETT DAM, WYO.

Location.—In the NE. ¼ sec. 7, T. 53 N., R. 100 W., at Corbett diversion dam, 8 miles below Cody, Wyo.

Records available.—April 20, 1908, to December 31, 1913.

Drainage area.—Not measured at this station; drainage area above Cody is 1,400 square miles. Sage Creek, the only important tributary that enters between this station and Cody, drains only about 25 square miles.

Gage.—Forty feet upstream from the crest of the dam; readings represent height of water above crest.

Determinations of discharge.—The discharge is computed by considering the dam as a weir and the sluice gates as submerged orifices. The following formula for discharge over the crest was developed by W. A. Lamb from measurements at Cody, Wyo.: $Q=3.50\ BH^{1.58}$. The dam is of reinforced concrete, of the buttressed type, having on the upstream side a deck 2½ feet thick, sloping 1 to 1, and supported by buttresses 2 feet thick spaced 14 feet on centers; it raises the low-water elevation of the river 10.2 feet; the length between abutments is 400 feet.

Diversions and storage.—Little water is diverted above this station, but the Shoshone reservoir, with a capacity of 456,000 acre-feet, regulates the flow.

Cooperation.—Gage heights and discharge into Corbett tunnel furnished by United States Reclamation Service.

Daily gage height, in feet, of Shoshone River at Corbett dam, Wyo., for 1913.

[L. L. Sutton and O. K. Pettee, observers.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.14	0.42	0.37	0.56	0.53	0.45	2.50	1.97	1.00	0.60	0.53	0.42
2	1.12	.41	.40	.54	.50	.65	2.40	1.85	.95	.61	.50	.....
3	1.10	.40	.42	.50	.51	.66	2.45	1.80	.94	.60	.59	.....
4	1.10	.80	.42	.57	.53	.67	2.52	1.77	.90	.59	.55	.....
5	1.09	.68	.42	.50	.50	.63	2.40	1.72	.87	.60	.....	.....
6	1.08	.40	.42	.50	.25	.62	2.35	1.70	.86	.66	.....	.....
7	1.08	.42	.47	.48	.30	.60	2.33	1.60	.83	.65	.....	.....
8	1.07	.41	.48	.45	.31	.58	2.40	1.50	.78	.64	.....	.....
9	1.06	.41	.50	.48	.30	.57	2.31	1.40	.76	.65	.....	.....
0	1.04	.41	.50	.50	.32	.57	2.30	1.40	.76	.66	.42	.....
1	1.03	.42	.49	.55	.33	.58	2.25	1.35	.75	.55	.41	.....
2	1.02	.42	.50	.61	.60	.60	2.09	1.32	.73	.53	.41	.....
3	1.01	.41	.45	.57	.61	.66	1.96	1.27	.71	.50	.41	.....
4	1.00	.42	.37	.55	.59	.72	1.75	1.22	.70	.49	.42	.....
5	.99	.43	.37	.55	.60	.78	1.65	1.13	.65	.47	.41	.....
6	.98	.50	.38	.60	.55	.77	1.63	1.08	.66	.50	.41	.....
7	.96	.55	.38	.71	.48	.76	1.58	1.05	.63	.56	.41	.....
8	.94	.53	.41	.90	.47	.77	1.53	1.05	.64	.55	.39	.....
9	.91	.55	.41	1.20	.49	.75	1.50	.98	.63	.54	.39	.43
0	.85	.54	.33	1.11	.72	.75	1.45	.97	.62	.54	.39	.43
1	.47	.52	.22	1.12	.73	.78	1.45	.91	.61	.53	.39	.43
2	.45	.40	.28	.96	.80	1.72	1.42	.84	.62	.54	.39	.44
3	.45	.38	.40	.97	.81	2.15	1.60	1.03	.62	.53	.41	.43
4	.46	.36	.40	.58	.79	2.40	1.69	.76	.63	.52	.41	.41
5	.48	.37	.39	.48	.80	2.40	1.73	.84	.64	.54	.41	.41
6	.48	.36	.37	.50	.81	2.25	1.70	.84	.57	.54	.42	.42
7	.47	.36	.35	.50	.83	2.32	2.00	.72	.59	.51	.42	.42
8	.47	.37	.38	.52	.81	2.50	2.10	.73	.56	.51	.42	.42
9	.45	.....	.43	.51	.83	2.60	2.05	.86	.56	.51	.42	.41
0	.42	.....	.47	.52	.85	2.80	2.10	.95	.55	.51	.42	.41
1	.42	.....	.41	.....	.30	.....	2.10	.98	.....	.52	.....	.41

NOTE.—Gage heights give the height of water above crest of the dam and were used to compute the flow over the dam only. Gage heights Feb. 4–5 distorted by ice. Ice present on dam Mar. 20–21, but gage heights are assumed correct. Nov. 5–9 and Dec. 2–18, total flow was going through the sluice gates.

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Daily discharge, in second-feet, of Shoshone River, including sluices and tunnels, at Corbett dam, Wyo., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1,740	358	294	566	664	658	6,020	4,210	1,580	715	546	376
2	1,690	344	330	534	628	973	5,630	3,820	1,500	731	497	377
3	1,640	330	358	470	657	990	5,810	3,660	1,470	714	629	376
4	1,640	330	358	582	689	1,070	6,080	3,580	1,330	699	575	377
5	1,620	330	358	470	657	1,020	5,630	3,440	1,250	659	559	379
6	1,590	330	358	470	371	1,000	5,480	3,410	1,240	761	543	379
7	1,590	358	428	442	419	967	5,480	3,160	1,200	809	483	381
8	1,570	344	442	400	433	935	5,850	2,900	1,100	799	422	381
9	1,540	344	470	442	436	919	5,600	2,630	1,070	816	390	382
10	1,500	344	470	470	464	919	5,560	2,610	1,050	833	379	384
11	1,470	358	456	550	476	935	5,390	2,460	1,020	644	385	384
12	1,450	358	470	647	860	951	4,860	2,410	1,000	603	385	376
13	1,420	344	400	582	877	1,013	4,400	2,330	964	557	381	368
14	1,400	358	294	550	844	1,080	3,760	2,210	946	560	391	369
15	1,380	278	294	550	860	1,160	3,460	1,990	844	540	377	370
16	1,360	410	306	630	826	1,140	3,410	1,850	844	533	377	371
17	1,310	550	306	818	748	1,120	3,270	1,760	793	590	377	372
18	1,270	518	344	1,180	758	1,140	3,130	1,760	810	582	350	372
19	1,200	550	344	1,880	753	1,100	3,060	1,600	793	571	350	372
20	1,080	534	246	1,660	1,080	1,100	2,930	1,580	776	571	350	372
21	428	502	134	1,690	1,080	1,150	2,930	1,490	735	555	350	373
22	400	330	191	1,310	1,200	3,470	2,850	1,400	738	571	346	376
23	400	306	330	1,330	1,240	4,860	3,300	1,790	728	555	368	372
24	414	282	330	598	1,180	5,720	3,460	1,180	734	539	368	344
25	442	294	318	442	1,180	5,710	3,540	1,320	751	571	370	344
26	442	282	294	470	1,200	5,160	3,450	1,360	609	571	386	368
27	428	282	270	532	1,260	5,390	4,380	1,170	631	523	383	368
28	428	294	306	563	1,280	6,050	4,680	1,180	641	523	377	368
29	400	.....	372	572	1,350	6,430	4,500	1,300	652	523	376	344
30	358	.....	428	648	1,400	7,220	4,640	1,520	636	521	376	344
31	358	.....	387	.....	500	.....	4,620	1,550	.....	530	.....	344

NOTE.—Discharge determined by adding the flow through the tunnel to the flow over the crest of the dam. Record of daily discharge through the tunnels was furnished by the United States Reclamation Service. The flow over the dam was obtained from a rating table computed by the formula $3.50BH^{1.88}$ (see station description). Discharge Feb. 4–5 interpolated. Water was shut off at the Shoshone dam from 5.30 p. m. Feb. 15 to 2 a. m. Feb. 16, but the gage was read at such times so that this fact does not appear; proper allowance made in determining discharge Feb. 15 and 16. Discharge interpolated Nov. 5–9 and Dec. 2–13, as total flow was going through the sluice gates. These are the only periods during which the sluice gates were open.

Monthly discharge of Shoshone River, including sluices and tunnels, at Corbett dam, Wyo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	1,740	358	1,100	67,600	B.
February	550	278	366	20,300	B.
March	470	134	345	21,200	B.
April	1,880	400	735	43,700	B.
May	1,400	371	851	52,300	B.
June	7,220	658	2,380	142,000	B.
July	6,080	2,850	4,420	272,000	B.
August	4,210	1,170	2,220	136,000	B.
September	1,580	609	948	56,400	B.
October	833	521	622	38,200	B.
November	639	346	415	24,700	B.
December	386	344	369	22,700	B.
The year	7,220	134	1,240	897,000	

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Daily discharge, in second-feet, of Corbett tunnel at Corbett dam, Wyo., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	146	258	74	128	184	85	28	18
2	.....	.....	158	258	49	134	207	84	27	19
3	.....	.....	171	258	49	134	196	84	25	18
4	.....	.....	171	318	49	138	152	85	25	18
5	.....	.....	187	337	54	153	128	29	41	19
6	.....	.....	209	337	85	180	143	29	57	18
7	.....	.....	209	337	154	219	158	94	29	19
8	.....	.....	211	337	267	242	158	101	0	18
9	.....	.....	226	337	337	242	158	101	0	18
10	.....	.....	230	337	344	219	140	101	21	19
11	.....	.....	230	337	347	197	134	94	41	18
12	.....	.....	230	321	365	227	146	85	41	9
13	.....	.....	230	281	378	267	146	87	37	.....
14	.....	.....	230	239	378	276	146	104	33	.....
15	.....	.....	230	211	376	276	129	112	33	.....
16	.....	.....	276	211	384	258	112	63	33	.....
17	.....	.....	306	211	392	241	112	24	33	.....
18	.....	.....	330	211	392	241	112	32	32	.....
19	.....	.....	297	211	400	241	112	37	32	.....
20	.....	.....	244	211	414	251	112	37	32	.....
21	.....	.....	227	204	414	294	88	37	32	.....
22	.....	.....	215	184	414	336	74	37	28	.....
23	.....	.....	236	159	356	321	64	37	24	.....
24	.....	.....	215	140	264	268	53	37	24	.....
25	.....	.....	197	134	222	259	53	37	26	.....
26	.....	.....	197	116	222	303	27	37	28	.....
27	.....	62	225	98	200	331	17	37	25	.....
28	.....	61	281	98	162	331	75	37	19	.....
29	.....	86	310	98	146	286	86	37	18	.....
30	.....	146	322	98	115	226	86	35	18	.....
31	43	.....	290	.....	103	191	.....	28	.....	.....

NOTE.—Discharge record, furnished by United States Reclamation Service, represents the amount of water diverted for irrigation.

Monthly discharge of Corbett tunnel at Corbett dam, Wyo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 31	.....	.....	43	85	
April 27–30	146	61	88.8	705	
May	330	146	233	14,300	
June	337	98	230	13,700	
July	414	49	255	15,700	
August	336	128	239	14,700	
September	207	17	117	6,960	
October	112	24	60.1	3,700	
November	57	0	28.1	1,670	
December 1–12	19	9	17.6	419	
The period	.....	.....	.....	71,900	

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SOAP CREEK NEAR ST. XAVIER, MONT.

Location.—On the Crow Indian reservation, one-fourth mile above headworks of Soap Creek ditch, in the W. ½ NW. ¼ sec. 2, T. 6 S., R. 32 E., about 9 miles south of St. Xavier, Mont.

Records available.—September 11, 1911, to December 31, 1913.

Drainage area.—Not measured.

Gage.—An overhanging chain gage on left bank about 100 feet above the ford.

Control.—Firm gravel and cobblestones 50 feet below the gage; permanent. Bed of stream is gravel and sand at gage.

Discharge measurements.—Made by wading at the ford 100 feet below the gage.

Winter flow.—Stream frozen during the winter months; winter gage heights of no value.

Diversion.—None above gage.

Discharge measurements of Soap Creek near St. Xavier, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 18	R. R. Randell	3.63	56	Aug. 26	J. M. Ray	3.22	16.9
May 21	do	3.49	35	Oct. 7	do	3.34	22
July 1	do	3.34	24				

Daily gage height, in feet, of Soap Creek near St. Xavier, Mont., for 1913.

[W. G. Warritt, observer.]

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1				3.27			3.54
2							
3							
4						3.34	
5		3.08	3.30				
6					3.28	3.34	
7							
8							3.34
9							
10				3.45			
11						3.49	
12			3.28				
13		3.04			3.27		
14							
15							3.44
16				3.30			
17							
18						3.34	
19			3.30				
20		3.42			3.29		
21							
22							3.34
23				3.10			
24							
25						3.38	
26			3.25	3.22			
27					3.78		
28		3.38					
29							3.44
30	3.04			3.29			
31							

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Daily discharge, in second-feet, of Soap Creek near St. Xavier, Mont., for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1		10	24	20	21	45	39
2		10	24	21	20	37	37
3		11	23	22	20	29	35
4		11	22	23	20	22	33
5		11	22	24	20	22	30
6		11	22	25	20	22	27
7		11	22	26	20	22	24
8		11	21	28	20	25	22
9		10	21	30	20	28	23
10		10	20	32	20	30	24
11		10	20	32	20	33	25
12		10	20	30	20	32	26
13		9.7	20	28	20	31	27
14		12	20	26	20	30	28
15		15	21	24	20	28	29
16		18	21	22	20	26	28
17		21	22	21	21	24	27
18		24	22	20	21	22	26
19		27	22	19	21	22	25
20		30	22	18	21	23	24
21		30	22	16	29	23	23
22		29	21	14	37	24	22
23		29	20	12	45	24	23
24		28	19	14	53	25	24
25		28	19	16	61	25	25
26		27	19	17	69	27	26
27		27	19	18	77	29	27
28		27	19	19	69	31	28
29		26	19	20	61	33	29
30	9.7	25	20	21	53	35	29
31			20	21		37	

NOTE.—Discharge determined as follows: May 30 to Sept. 27, from a fairly well defined rating curve Oct. 4 to Nov. 30, from a poorly defined rating curve. Discharge interpolated for days on which gage was not read.

Monthly discharge of Soap Creek near St. Xavier, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
June	30	9.7	18.6	1,110	C.
July	24	19	20.9	1,290	B.
August	32	12	21.9	1,350	C.
September	77	20	32.0	1,900	C.
October	45	22	27.9	1,720	C.
November	39	22	27.2	1,620	C.
The period				8,990	

ROTTENGRASS CREEK NEAR ST. XAVIER, MONT.

Location.—On the Crow Indian reservation, one-fourth mile above the crossing of the Bighorn canal, in the NW. ¼ sec. 6, T. 5 S., R. 33 E., about 4 miles southeast of St. Xavier, Mont.

Records available.—September 9, 1911, to December 31, 1913.

Gage.—Overhanging chain gage on left bank.

Control.—Likely to change. Bed of stream is composed of sand and silt. The channel is deep and current sluggish for several hundred feet above and below the gage.

Discharge measurements.—Made by wading above the gage.

Winter flow.—Channel freezes during winter months.

Diversions. None.

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Discharge measurements of Rottengrass Creek near St. Xavier, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 18	R. R. Randell	4.65	23
May 20	do	4.48	27.8
June 30	do	3.87	14.9
Oct. 7	J. M. Ray	3.35	7.4

Daily gage height, in feet, and discharge, in second-feet, of Rottengrass Creek near St. Xavier Mont., for 1913.

[W. H. Ferguson, observer.]

Day.	June.		July.		August.		September.		October.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	4.4	26	3.9	15	.....	6	3.3	7	.....	14
2	.....	29	.....	16	3.2	6	.....	7	3.8	13
3	4.6	32	4.0	17	.....	6	3.3	7	.....	13
4	.....	30	.....	16	3.3	7	.....	7	.....	14
5	4.5	29	3.9	15	.....	7	.....	7	.....	14
6	.....	28	.....	15	3.3	7	.....	6	.....	15
7	4.4	26	3.9	15	.....	7	.....	6	3.9	15
8	.....	26	.....	14	3.3	7	3.2	6	.....	15
9	4.4	26	3.8	13	.....	8	.....	6	.....	16
10	.....	22	.....	10	3.4	8	3.2	6	4.0	17
11	4.1	19	3.4	8	.....	8	.....	6	.....	17
12	.....	18	3.4	8	3.3	7	.....	6	.....	16
13	4.0	17	.....	9	.....	7	3.25	6.5	.....	15
14	4.6	32	3.6	10	3.4	8	.....	6	3.9	15
15	.....	29	.....	9	.....	8	3.2	6	.....	13
16	4.4	26	3.4	8	3.3	7	.....	7	3.7	11
17	4.1	19	.....	8	.....	6	3.4	8	.....	10
18	4.0	17	3.3	7	3.2	6	.....	8	3.5	9
19	.....	24	3.3	7	.....	6	.....	9	.....	9
20	4.6	32	.....	7	3.2	6	3.5	9	3.5	9
21	4.4	26	3.3	7	.....	7	.....	8	.....	9
22	.....	20	.....	6	3.3	7	3.25	6.5	3.5	9
23	3.9	15	3.2	6	.....	7	.....	10	.....	7
24	4.6	32	.....	6	3.3	7	.....	14	3.4	8
25	.....	25	3.2	6	.....	7	4.1	19	.....	10
26	.....	19	3.3	7	3.25	6.5	.....	14	.....	12
27	3.8	13	.....	7	.....	7	3.6	10	3.8	13
28	.....	13	3.4	8	3.4	8	.....	12	.....	11
29	.....	14	.....	7	.....	8	.....	14	.....	10
30	.....	15	3.3	7	.....	7	3.9	15	3.5	9
31	.....	.....	3.3	7	.....	7	.....	.....	.....	9

Daily discharge determined from a well-defined curve.

Monthly discharge of Rottengrass Creek near St. Xavier, Mont., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
June	32	13	23.3	1,390	A.
July	17	6	9.7	596	B.
August	8	6	7.0	430	B.
September	19	6	8.6	512	B.
October	17	7	12.2	750	B.
The period	.....	.....	.....	3,680	

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LITTLE BIGHORN RIVER NEAR WYOLA, MONT.

Location.—On the Crow Indian Reservation, one-fourth mile below proposed headworks of Little Bighorn canal No. 3, in the N. ½ SW. ¼ sec. 28, T. 8 S., R. 35 E., about 4 miles southwest of Wyola about 16 miles above mouth of Lodge Grass Creek.

Records available.—September 7, 1911, to December 31, 1913.

Drainage area.—260 square miles.

Gage.—Overhanging chain gage on right bank.

Control.—Practically permanent. Bed of stream is composed of gravel and cobblestones.

Discharge measurements.—Made by wading at ford below the gage.

Winter flow.—Channel filled with ice during winter months.

Diversion.—None.

Discharge measurements of Little Bighorn River near Wyola, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 19	W. A. Lamb	[a] 4.18	77	July 5	R. R. Randell	4.90	299
Apr. 22	R. R. Randell	4.70	242	Aug. 24	J. M. Ray	4.40	122
May 23	do	5.38	490	Oct. 10	do	4.36	116

[a] Ice present.

Daily gage height, in feet, of Little Bighorn River near Wyola, Mont., for 1913.

[Leslie Schroeder, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	4.8	6.4	4.95	4.55	4.35	4.35	4.35
2	.....	4.7	6.4	5.0	4.5	4.35	4.35	4.4
3	.....	4.65	6.2	4.9	4.55	4.35	4.3	4.35
4	.....	4.65	6.2	4.9	4.5	4.30	4.4	4.35
5	.....	4.55	6.1	4.85	4.5	4.30	4.45	4.35
6	.....	4.5	6.0	4.8	4.5	4.3	4.4	4.35
7	.....	4.5	5.9	4.8	4.5	4.3	4.4	4.35
8	.....	4.6	5.9	4.8	4.5	4.3	4.4	4.3
9	.....	4.85	5.85	4.75	4.55	4.25	4.35	4.3
10	.....	5.1	5.8	4.75	4.5	4.3	4.35	4.3
11	.....	5.55	5.7	4.8	4.5	4.25	4.35	4.35
12	.....	5.6	5.6	4.75	4.45	4.3	4.35	4.3
13	4.45	5.5	5.5	4.75	4.45	4.3	4.35	4.3
14	4.50	5.4	5.4	4.75	4.45	4.3	4.35	4.3
15	4.50	5.3	5.4	4.75	4.45	4.4	4.35	4.3
16	4.45	5.25	5.35	4.7	4.4	4.4	4.35	4.25
17	4.5	5.2	5.3	4.7	4.4	4.35	4.3	4.25
18	4.5	5.15	5.2	4.65	4.4	4.35	4.35	4.25
19	4.5	5.35	5.2	4.6	4.4	4.35	4.35	4.3
20	4.6	5.2	5.1	4.6	4.4	4.35	4.35	4.25
21	4.6	5.1	5.15	4.55	4.35	4.35	4.35	4.3
22	4.7	5.1	5.1	4.65	4.4	4.35	4.35	4.25
23	4.55	5.35	5.1	4.65	4.35	4.5	4.35	4.25
24	4.5	5.7	5.1	4.65	4.35	4.5	4.3	4.25
25	4.4	5.9	5.1	4.6	4.35	4.4	4.45	4.25
26	4.45	6.1	5.1	4.6	4.35	4.4	4.35	4.3
27	4.45	6.4	5.1	4.65	4.35	4.4	4.4	4.25
28	4.6	6.5	5.05	4.6	4.35	4.35	4.45	4.25
29	4.7	6.6	5.05	4.5	4.35	4.4	4.4	4.25
30	4.8	6.6	5.05	4.5	4.35	4.35	4.35	4.25
31	.....	6.6	.....	4.55	4.35	.....	4.35	.....

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Daily discharge, in second-feet, of Little Bighorn River near Wyola, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	273	1,080	322	192	114	114	114
2	.....	243	1,080	339	176	114	114	122
3	.....	229	951	305	183	114	105	114
4	.....	229	951	305	167	105	122	114
5	.....	202	889	289	163	105	132	114
6	.....	190	828	273	161	105	122	114
7	.....	190	768	273	159	105	122	114
8	.....	215	768	273	157	105	122	105
9	.....	289	739	258	165	98	114	105
10	.....	376	710	258	150	105	114	105
11	.....	577	655	273	146	98	114	114
12	.....	602	602	258	132	105	114	105
13	179	552	552	258	132	105	114	105
14	190	504	504	258	132	105	114	105
15	190	459	504	258	132	122	114	105
16	179	438	482	243	122	122	114	98
17	190	416	459	243	122	114	105	98
18	190	396	416	229	122	114	114	98
19	190	482	416	215	122	114	114	105
20	215	416	376	215	122	114	114	98
21	215	376	396	302	114	114	114	105
22	243	376	376	229	122	114	114	98
23	202	482	376	229	114	142	114	98
24	190	655	376	229	114	142	105	98
25	168	768	376	215	114	122	132	98
26	179	889	376	215	114	122	114	105
27	179	1,080	376	229	114	122	122	98
28	215	1,140	358	215	114	114	132	98
29	243	1,200	358	190	114	122	122	98
30	273	1,200	358	187	114	114	114	98
31	.....	1,200	.....	196	114	.....	114	.....

NOTE.—Discharge determined as follows: To July 28, from a rating curve well defined between 190 and 550 second-feet, fairly well defined at lower stages, and poorly defined at higher stages; July 29 to Aug. 11, by indirect method for shifting channel; Aug. 12 to Nov. 30, from a fairly well-defined rating curve.

Monthly discharge of Little Bighorn River near Wyola, Mont., for 1913.

[Drainage area, 360 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
April 13-30	273	168	202	0.777	0.52	7,210	A.
May	1,200	190	537	2.07	2.39	33,000	B.
June	1,080	358	582	2.24	2.50	34,600	B.
July	339	187	251	.965	1.11	15,400	B.
August	192	114	136	.523	.60	8,360	C.
September	142	98	114	.438	.49	6,780	B.
October	132	105	116	.446	.51	7,130	B.
November	122	98	105	.404	.45	6,250	B.
The period	.....	.....	.....	.....	.....	119,000	

LITTLE BIGHORN RIVER NEAR CROW AGENCY, MONT.

Location.—On the Crow Indian Reservation at the Chicago, Burlington & Quincy Railroad bridge, 2 miles south of Crow Agency, Mont., in the W. ½ sec. 18, T. 2 S., R. 35 E., about 14 miles above the junction with Bighorn River.

Records available.—March 24, 1905, to June 30, 1906; September 7, 1911, to December 31, 1913.

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Drainage area.—1,190 square miles.

Gage.—Vertical staff attached to downstream end of a pile bridge pier. The records from March 24, 1905, to June 30, 1906, were obtained from a chain gage attached to the upstream side of the railroad bridge at Crow Agency, about 2 miles farther downstream. No tributaries enter between these two points.

Control.—Permanent. Bed of the stream is coarse gravel and cobblestones. Current is broken by the piers of the bridge and is sluggish at the gage.

Discharge measurements.—Made from downstream side of the bridge; low-water measurements are made by wading at the ford about 75 feet above the bridge.

Winter flow.—Affected by ice, which forms at the control below the bridge.

Diversion.—Crow Agency ditch diverts water between the station and the old station at Crow agency.

Discharge measurements of Little Bighorn River near Crow Agency, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 21	W. A. Lamb	5.00	96	July 2	R. R. Randell	5.16	502
Apr. 19	R. R. Randell	5.14	583	Aug. 26	J. M. Ray	4.22	158
May 20	do	5.69	981	Oct. 6	do	4.50	202

Daily gage height, in feet, of Little Bighorn River near Crow Agency, Mont., for 1913.

[O. Burgess and A. McLauchlin, observers.]

Day.	Apr.	May.	June.	July.	Aug.	Oct.	Nov.	Dec.
1	9.1	5.5	7.1	5.15	.....	.....	5.2	5.2
2	8.0	5.6	6.9	5.2	.....	.....	5.2	5.2
3	6.2	5.5	6.9	5.0	.....	.....	5.3	5.4
4	5.2	5.5	6.7	5.0	.....	.....	5.3	5.4
5	5.5	5.3	6.6	4.7	.....	4.5	5.3	5.3
6	6.0	5.3	6.5	4.8	.....	4.5	5.3	5.2
7	7.4	5.1	6.3	4.5	.....	4.5	5.3	5.3
8	5.3	5.1	6.1	4.6	.....	4.5	5.3	5.2
9	5.6	5.1	6.2	4.7	.....	4.6	5.3	5.3
10	5.4	5.3	6.0	4.6	.....	4.6	5.25	5.3
11	5.3	5.5	5.9	4.7	.....	4.7	5.3	5.3
12	5.3	5.7	5.9	4.4	.....	4.7	5.3	5.3
13	5.4	6.1	5.8	4.6	.....	4.7	5.3	5.3
14	5.6	5.8	5.6	4.7	.....	4.8	5.3	5.3
15	5.4	5.7	5.6	4.7	.....	4.8	5.3	5.3
16	5.4	5.7	5.7	4.6	.....	4.8	5.3	5.3
17	5.2	5.7	5.8	4.6	.....	4.7	5.3	5.3
18	5.2	5.6	5.6	4.7	.....	4.7	5.3	5.1
19	5.2	5.6	5.8	4.6	.....	4.7	5.2	5.2
20	5.1	5.7	5.9	4.5	4.3	4.8	5.3	5.2
21	5.3	5.6	5.5	4.6	4.4	4.9	5.2	5.3
22	5.3	5.5	5.5	4.6	4.2	5.0	5.3	5.2
23	5.4	5.5	5.4	4.6	4.1	.0	5.3	.....
24	5.4	5.6	5.1	4.5	4.2	5.0	5.3	.....
25	5.3	5.8	5.3	4.6	4.25	5.0	5.1	.....
26	5.4	6.1	5.3	4.6	4.2	5.05	5.3	.....
27	5.3	6.5	5.2	.....	4.3	5.1	5.3	.....
28	5.2	6.9	5.0	.....	4.3	5.1	5.2	.....
29	5.3	7.0	5.2	.....	4.3	5.1	5.3	.....
30	5.4	7.1	5.2	.....	.....	5.1	5.3	.....
31	.....	6.9	.....	.....	.....	5.2	.....	.....

NOTE.—Gage heights Apr. 1 and 2 probably affected by ice jams below gage. Gage heights for October to December are of doubtful accuracy.

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Daily discharge, in second-feet, of Little Bighorn River near Crow Agency, Mont., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Day.	Apr.	May.	June.	July.	Aug.
1	.....	830	2,210	505	.....	16	760	980	980	240	.....
2	.....	900	2,010	530	.....	17	640	980	1,060	240	.....
3	1,220	830	2,010	430	.....	18	640	900	900	280	.....
4	565	830	1,820	430	.....	19	640	900	1,060	240	.....
5	760	700	1,730	280	.....	20	530	980	1,140	210	160
6	1,160	700	1,640	330	.....	21	700	900	800	240	180
7	2,560	590	1,460	210	.....	22	700	830	800	240	140
8	700	590	1,300	240	.....	23	760	830	720	240	125
9	900	590	1,380	280	.....	24	760	900	550	210	140
10	760	700	1,220	240	.....	25	700	1,060	640	240	150
11	700	830	1,140	280	.....	26	760	1,300	640	240	140
12	700	980	1,140	180	.....	27	700	1,640	560	.....	160
13	760	1,330	1,060	240	.....	28	640	2,010	450	.....	160
14	900	1,060	900	280	.....	29	700	2,110	530	.....	160
15	760	980	900	280	.....	30	760	2,210	530	.....	.....
						31	.....	2,010	.....	.....	.....

NOTE.—Discharge determined from two fairly well-defined rating curves applicable Apr. 8 to June 20 and July 1 to Aug. 29. Indirect methods used Apr. 3 to 7 and June 21 to 30.

Monthly discharge of Little Bighorn River near Crow Agency, Mont., for 1913.

[Drainage area, 1,190 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
April 3–30	2,560	590	821	0.690	0.72	45,600	B.
May	2,210	590	1,060	.891	1.03	65,200	B.
June	2,210	450	1,110	.933	1.04	66,000	B.
July 1–26	530	180	283	.238	.23	14,600	B.
Aug. 20–29	180	125	152	.128	.05	3,020	B.

LODGEGRASS CREEK NEAR LODGEGRASS, MONT.

Location.—Above road crossing one-fourth mile above headworks of Lodgegrass ditch, in the SW. ¼ sec. 29, T. 6 S., R. 35 E., about 6 miles southwest of Lodgegrass, Mont.

Records available.—September 9, 1911, to December 31, 1913.

Drainage area.—142 square miles.

Gage.—Overhanging chain gage on left bank. On July 3, 1913, a new gage was installed 50 feet below the old station and at the same datum. The control and channel are practically the same as at the former site.

Control.—Firm gravel and cobblestones at the ford below the gage; permanent. Bed of stream at gage composed of mud and silt. Current sluggish at gage at low stages.

Discharge measurements.—Made by wading at ford below gage.

Winter flow.—Stream freezes over during winter months.

Diversion.—None.

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Discharge measurements of Lodgegrass Creek near Lodgegrass, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 19	W. A. Lamb	a 4.5	40	July 3	R. R. Randell	3.98	76
Apr. 21	R. R. Randell	4.01	70	Aug. 25	J. M. Ray	3.43	22
May 22	do	4.44	128	Oct. 9	do	3.54	26

a Ice present.

Daily gage height, in feet, and discharge, in second-feet, of Lodgegrass Creek near Lodgegrass, Mont., for 1913.

[Florence Campbell, observer.]

Day.	April.		May.		June.		October.		November.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	4.28	107	6.8	628	.....	29	.....	33
2	.....	.....	3.96	67	.....	628	.....	29	3.6	33
3	.....	.....	4.24	102	6.8	628	.....	29	.....	33
4	.....	.....	4.12	86	6.8	628	.....	29	.....	33
5	.....	.....	4.10	83	6.8	628	.....	29	.....	32
6	.....	.....	4.17	92	6.8	628	.....	28	.....	32
7	.....	.....	4.15	90	.....	.....	.....	28	.....	31
8	.....	.....	4.03	75	.....	.....	.....	28	.....	31
9	.....	.....	4.11	84	.....	.....	3.54	28	3.58	31
10	.....	.....	4.29	109	.....	.....	.....	28	.....	31
11	.....	.....	3.96	67	.....	.....	.....	27	.....	30
12	.....	.....	3.94	64	.....	.....	3.52	27	.....	30
13	.....	.....	3.92	62	.....	.....	.....	27	.....	30
14	.....	.....	.....	115	.....	.....	.....	27	.....	30
15	.....	.....	4.68	168	.....	.....	.....	26	.....	29
16	.....	.....	4.75	180	.....	.....	.....	26	3.55	29
17	.....	.....	4.73	176	.....	.....	.....	25	.....	29
18	.....	.....	4.71	173	.....	.....	.....	25	.....	29
19	.....	.....	4.79	186	.....	.....	3.5	25	.....	28
20	.....	.....	4.67	166	.....	.....	.....	25	.....	28
21	4.01	72	.....	148	.....	.....	.....	26	.....	27
22	.....	82	4.44	130	.....	.....	.....	27	.....	27
23	.....	92	4.35	117	.....	.....	.....	28	3.52	27
24	4.24	102	4.7	171	.....	.....	.....	29	.....	27
25	.....	92	5.8	392	.....	.....	.....	29	.....	27
26	4.09	82	.....	370	.....	.....	3.55	29	.....	26
27	4.07	79	5.6	348	.....	.....	.....	29	.....	26
28	3.85	55	5.7	370	.....	.....	.....	30	.....	26
29	4.03	75	5.8	392	.....	.....	.....	31	.....	25
30	.....	90	5.8	392	.....	.....	.....	31	.....	25
31	.....	.....	.....	510	.....	.....	.....	32	.....	.....

NOTE.—Discharge determined from a rating curve fairly well defined below 225 second-feet. Discharge interpolated for days for which gage heights are missing. The gage was moved 50 feet downstream July 3 and reset to same datum. The control and channel are the same as at the old station, so that practically the same rating curve is applicable.

Monthly discharge of Lodgegrass Creek near Lodgegrass, Mont., for 1913.

[Drainage area, 142 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
April 21–30	102	55	82.1	0.578	0.21	1,630	B.
May	510	62	180	1.27	1.46	11,100	B.
June 1–6	628	628	628	4.42	.99	7,470	C.
October	32	25	27.9	.196	.23	1,720	C.
November	33	25	29.2	.206	.23	1,740	C.

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LITTLE MISSOURI RIVER BASIN.

LITTLE MISSOURI RIVER NEAR ALZADA, MONT.

Location.—At Walker's ranch, 2 miles below mouth of Thompson Creek, near southwest corner of T. 8 S., R. 60 E., 300 yards below a proposed dam and 4 miles below Alzada, Mont.

Records available.—April 30, 1904, to November 30, 1906; June 18, 1911, to December 31, 1913.

Drainage area.—About 780 square miles.

Gage.—Overhanging chain gage on right bank. During 1911 a vertical staff gage, 150 feet farther downstream on the left bank, was used. Datum of chain gage is 0.08 foot lower than that of staff gage. Control points also different.

Control.—May shift during highwater. Stream sluggish; banks cut 5 to 15 feet in the sandy soil.

Discharge measurements.—At ordinary stages made by wading; at flood stages, from a cable.

Winter flow.—Affected by ice.

Accuracy.—High-water measurements sufficient to define a rating curve for use in making estimates of daily discharge for 1912 and 1913 were obtained during 1914.

Discharge measurements of Little Missouri River near Alzada, Mont., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 22	C. S. Heidel	2.47	15.2
Sept. 19	....do	4.48	459
20	....do	3.03	90
21	....do	2.71	38

Daily gage height, in feet, of Little Missouri River near Alzada, Mont., for 1913.

[John Walker, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.83	.....	.....	14.1	2.24	2.36	3.15	2.21	2.02	2.41	2.24	2.23
2	2.85	.....	.....	13.0	2.25	2.38	2.90	2.16	2.00	2.35	2.26	2.24
3	2.81	.....	.....	10.8	2.29	2.30	2.48	2.14	1.98	2.32	2.25	2.23
4	2.32	.....	.....	10.1	2.30	2.22	2.42	2.12	1.94	2.31	2.25	2.25
5	1.83	.....	.....	6.2	2.32	2.21	2.35	2.12	1.90	2.38	2.25	2.26
6	1.80	.....	6.8	6.0	2.30	2.20	2.3	2.28	1.90	3.2	2.26	2.26
7	.86	.....	6.6	7.1	2.30	2.75	2.92	3.05	1.89	3.8	2.25	2.25
8	.85	.....	6.8	6.7	2.30	2.48	2.45	4.1	1.87	3.8	2.27	2.25
9	1.84	.....	7.6	4.2	2.29	2.40	2.34	4.1	1.85	2.94	2.27	2.25
10	1.83	.....	8.6	3.5	2.28	2.32	2.31	2.85	1.82	2.66	2.23	2.25
11	1.86	.....	8.9	3.2	2.27	2.28	2.28	2.48	1.80	2.52	2.23	2.27
12	2.80	.....	6.6	2.98	2.27	2.23	2.24	2.36	1.77	2.46	2.23	2.27
13	2.81	.....	5.0	2.95	2.28	3.6	2.23	2.30	1.76	2.41	2.23	2.27
14	2.32	.....	3.7	3.1	2.27	4.0	2.19	2.24	1.78	2.34	2.23	2.27
15	1.85	.....	3.3	3.1	2.28	3.35	2.17	2.20	1.83	2.30	2.24	2.27
16	1.85	.....	3.05	2.96	2.32	2.95	2.17	2.19	7.7	2.29	2.27	2.27
17	2.79	.....	2.90	2.88	2.32	3.2	2.22	2.16	10.5	2.28	2.27	2.27
18	2.81	.....	3.15	2.75	2.35	4.5	2.89	2.15	11.3	2.25	2.27	2.27
19	.....	4.7	2.95	2.70	2.90	3.55	4.2	2.22	6.6	2.24	2.27	2.27
20	.....	5.4	2.65	2.60	3.5	2.68	3.35	2.50	2.98	2.25	2.26	2.30
21	.....	.....	2.65	2.52	3.05	2.48	2.52	2.38	2.68	2.24	2.25	2.30
22	.....	.....	2.65	2.47	2.6	2.38	2.86	2.28	2.55	2.22	2.25	2.30
23	.....	.....	2.64	2.42	2.48	2.38	2.54	2.26	2.98	2.23	2.25	2.30
24	.....	.....	2.64	2.40	2.38	2.34	2.40	2.22	4.8	2.23	2.25	2.31
25	.....	.....	2.64	2.32	2.32	2.30	2.33	2.16	5.5	2.25	2.25	2.33
26	.....	.....	2.64	2.30	2.29	2.32	2.32	2.15	4.1	2.27	2.25	2.32
27	.....	.....	2.54	2.30	2.27	2.31	2.32	2.11	3.05	2.25	2.25	2.33
28	.....	.....	2.45	2.28	2.27	2.30	2.26	2.10	2.77	2.25	2.23	2.32
29	.....	.....	2.46	2.27	2.25	2.79	2.22	2.06	2.60	2.26	2.23	2.33
30	.....	.....	4.9	2.25	2.24	3.1	2.21	2.04	2.49	2.24	2.23	2.32
31	.....	.....	12.4	.....	2.22	.....	2.23	2.03	.....	2.23	.....	2.32

NOTE.—Gage heights Jan. 1 to Mar. 30 are affected by ice.

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Daily discharge, in second-feet, of Little Missouri River near Alzada, Mont., for 1912–13.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1912.										
1	.....	.....	76	13	5.0	2.8	0.8	26	3.0	2.6
2	.....	.....	76	11	17	36	.8	11	3.4	2.8
3	.....	.....	76	10	15	470	.9	7.5	3.8	3.0
4	.....	2,160	52	9.0	50	670	.8	6.2	3.4	2.8
5	.....	2,230	435	8.0	670	1,250	.7	4.6	3.8	2.4
6	.....	4,550	1,570	9.0	1,190	895	.7	183	3.8	2.4
7	.....	3,200	2,040	10	196	115	.6	670	3.4	2.4
8	.....	2,550	2,200	8.0	43	44	.6	538	3.8	2.8
9	.....	1,040	1,040	6.6	20	27	.5	97	3.4	3.0
10	.....	1,390	330	7.5	14	14	.6	40	2.8	3.0
11	.....	1,160	115	43	10	26	.8	27	3.8	2.8
12	.....	925	71	955	11	13	.6	15	3.4	2.8
13	.....	998	59	208	8.0	9.0	.8	10	3.0	3.0
14	.....	1,070	44	57	5.8	8.0	.6	8.0	3.0	3.8
15	.....	1,100	37	62	5.4	6.6	.8	6.2	2.8	3.8
16	.....	504	28	106	5.0	3.4	1.2	5.4	2.6	3.8
17	.....	1,960	25	52	5.4	3.4	6.6	5.4	2.8	3.8
18	.....	2,040	25	24	5.0	159	9.5	3.0	2.8	3.4
19	.....	2,040	21	19	4.6	97	4.2	2.6	2.8	3.4
20	.....	2,020	22	13	3.8	115	5.0	1.2	2.6	3.4
21	.....	2,100	30	10	3.0	50	16	2.0	2.6	4.2
22	.....	1,860	571	8.5	3.0	15	20	2.0	2.6	5.4
23	.....	1,390	801	5.8	2.6	10	46	1.8	2.2	4.6
24	.....	801	864	5.4	4.2	7.0	400	1.4	2.2	4.6
25	.....	604	136	4.2	2.8	4.6	604	1.4	2.2	5.4
26	.....	504	47	3.0	5.4	3.4	736	1.4	2.2	5.4
27	.....	400	31	2.8	4.2	2.4	400	1.4	2.2	5.4
28	.....	295	21	2.2	12	2.0	159	2.0	2.6	5.4
29	.....	136	15	5.0	21	1.6	148	2.0	2.6	5.4
30	.....	106	12	4.6	8.5	1.0	80	2.0	2.6	5.4
31	.....	.....	12	.....	5.0	.9	.....	3.0	.....	5.4
1913.										
1	.....	3,950	4.6	10	106	3.4	0.6	13	4.6	4.2
2	.....	3,400	5.0	11	65	2.2	.5	9.5	5.4	4.6
3	.....	2,440	6.6	7.0	18	1.8	.4	8.0	5.0	4.2
4	.....	2,200	7.0	3.8	13	1.4	.3	7.5	5.0	5.0
5	.....	1,040	8.0	3.4	9.5	1.4	.1	11	5.0	5.4
6	1,220	985	7.0	3.0	7.0	6.2	.1	115	5.4	5.4
7	1,160	1,300	7.0	45	68	88	.1	265	5.0	5.0
8	1,220	1,190	7.0	18	16	365	.1	265	5.8	5.0
9	1,450	400	6.6	12	9.0	365	.0	71	5.8	5.0
10	1,740	183	6.2	8.0	7.5	58	.0	35	4.2	5.0
11	1,840	115	5.8	6.2	6.2	18	.0	21	4.2	5.8
12	1,160	77	5.8	4.2	4.6	10	.0	16	4.2	5.8
13	670	72	6.2	208	4.2	7.0	.0	13	4.2	5.8
14	235	97	5.8	330	2.8	4.6	.0	9.0	4.2	5.8
15	136	97	6.2	148	2.4	3.0	.0	7.0	4.6	5.8
16	88	74	8.0	72	2.4	2.8	1,480	6.6	5.8	5.8
17	65	62	8.0	115	3.8	2.2	2,330	6.2	5.8	5.8
18	106	45	9.5	504	64	2.0	2,630	5.0	5.8	5.8
19	72	39	65	196	400	3.8	1,160	4.6	5.8	5.8
20	34	28	183	37	148	19	77	5.0	5.4	7.0
21	34	21	88	18	21	11	37	4.6	5.0	7.0
22	34	17	28	11	59	6.2	24	3.8	5.0	7.0
23	32	13	18	11	23	5.4	77	4.2	5.0	7.0
24	32	12	11	9.0	12	3.8	604	4.2	5.0	7.5
25	32	8.0	8.0	7.0	8.5	2.2	833	5.0	5.0	8.0
26	32	7.0	6.6	8.0	8.0	2.0	365	5.8	5.0	8.0
27	23	7.0	5.8	7.5	8.0	1.2	88	5.0	5.0	8.0
28	16	6.2	5.8	7.0	5.4	1.0	47	5.0	4.2	8.0
29	16	5.8	5.0	50	3.8	.8	28	5.4	4.2	8.0
30	637	5.0	4.6	97	3.8	.7	18	4.6	4.2	8.0
31	3,100	.....	3.8	.....	4.2	.6	.....	4.2	.....	8.0

NOTE.—Discharge determined from a well-defined rating curve based on discharge measurements made during 1912 to 1914.

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Monthly discharge of Little Missouri River near Alzada, Mont., for 1912–13.

Month.	Discharge in second-feet.			Run-off (total in acre-feet)	Accuracy.
	Maximum.	Minimum.	Mean.		
1912.					
April 4–30	4,550	106	1,450	77,700	A.
May	2,200	12	351	21,600	A.
June	955	2.2	56.1	3,340	A.
July	1,190	2.6	76.0	4,670	A.
August	1,250	.9	131	8,060	A.
September	736	.5	88.2	5,250	A.
October	670	1.2	54.4	3,340	A.
November	3.8	2.2	2.94	175	A.
December	5.4	2.4	3.80	234	A.
The period				124,000	
1913.					
March 5–31	3,100	16	584	30,100	A.
April	3,950	5.0	597	35,500	A.
May	183	3.8	17.8	1,090	A.
June	504	3.0	65.6	3,900	A.
July	400	2.4	35.9	2,210	A.
August	365	.6	32.3	1,990	A.
September	2,630	.0	327	19,500	A.
October	265	3.8	30.5	1,880	A.
November	5.8	4.2	4.96	295	A.
December	8.0	4.2	6.21	382	A.
The period				96,800	

KNIFE RIVER BASIN.

KNIFE RIVER NEAR BRONCHO, N. DAK.

Location.—At C. D. Smith's ranch, in the SE. ¼ sec. 4, T. 142 N., R. 90 W., at former site of the post office of Broncho; present post office is about 6 miles from old site. Spring Creek enters about 15 miles below station and Elm Creek half a mile above.

Records available.—May 29, 1903, to December 31, 1913.

Drainage area.—1,260 square miles; drainage area at the present site is practically the same as at the original site, 2 miles farther downstream, the area at the lower point being perhaps 5 square miles greater.

Gage.—Chain, on left bank just below observer's house; datum unchanged since March 23, 1905, when station was moved from original site about 2 miles farther downstream.

Channel.—Practically permanent.

Discharge measurements.—At high stages made from car and cable 500 feet below gage; at low stages by wading.

Winter flow.—Affected by ice.

Accuracy.—Results should be fair.

Discharge measurements of Knife River near Broncho, N. Dak., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 12	W. B. Stevenson	4.95	139
May 31	....do	4.13	49
Aug. 11	....do	3.68	6.8

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Daily gage height, in feet, of Knife River near Broncho, N. Dak., for 1913.

[C. D. Smith, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	20.2	4.0	4.0	3.7	3.5	3.8	3.6	3.7
2	.....	13.75	4.0	4.0	3.7	3.5	3.8	3.6	3.7
3	.....	11.55	4.0	4.0	3.7	3.5	3.7	3.6	3.7
4	.....	10.0	3.9	3.9	3.7	3.5	3.7	3.6	3.7
5	.....	10.0	3.9	3.9	3.7	3.5	3.6	3.6	3.7
6	.....	10.0	3.9	3.9	3.7	3.5	3.6	3.6	3.7
7	.....	8.3	3.9	3.9	3.7	3.5	3.6	3.6	3.7
8	.....	7.5	3.9	3.8	3.7	3.5	3.6	3.6	3.7
9	6.0	7.0	3.9	3.8	3.7	3.5	3.6	3.6	3.8
10	6.4	6.6	3.9	3.8	3.7	3.6	3.6	3.6	3.8
11	5.8	5.5	3.9	3.8	3.7	3.7	3.6	3.6	3.8
12	5.7	.....	3.9	3.8	3.7	3.7	3.6	3.7	3.8
13	5.7	4.8	3.9	3.8	3.7	3.7	3.6	3.7	3.8
14	5.7	4.7	3.9	3.8	3.7	3.7	3.5	3.7	3.8
15	5.7	4.6	3.9	3.8	3.7	3.7	3.5	3.7	3.8
16	5.7	4.6	3.9	3.8	3.7	3.9	3.5	3.7	3.8
17	5.7	4.3	3.9	3.8	3.7	3.8	3.5	3.7	3.8
18	5.7	4.2	3.9	3.8	3.7	3.8	3.5	3.7	3.7
19	5.7	4.2	4.0	3.8	3.7	3.8	3.5	3.7	3.7
20	5.7	4.2	4.0	3.8	3.7	3.8	3.5	3.7	3.7
21	5.7	4.2	4.1	3.8	3.7	3.8	3.5	3.7	3.7
22	5.7	4.2	4.2	3.8	3.7	3.8	3.5	3.7	3.7
23	5.7	4.1	4.2	3.8	3.7	4.0	3.6	3.7	3.7
24	5.7	4.1	4.2	3.8	3.7	4.0	3.6	3.7	3.7
25	.....	4.1	4.1	3.8	3.6	3.9	3.6	3.7	3.7
26	.....	4.1	4.1	3.8	3.6	3.9	3.6	3.7	3.7
27	.....	4.0	4.1	3.8	3.5	3.9	3.6	3.7	3.7
28	.....	4.0	4.1	3.8	3.5	3.9	3.6	3.7	3.7
29	5.7	4.0	4.1	3.8	3.5	3.8	3.6	3.7	3.7
30	7.45	4.0	4.1	3.8	3.5	3.8	3.6	3.7	.....
31	17.75	.....	4.1	.....	3.5	3.8	.....	3.7	.....

NOTE.—Discharge relation affected by ice during March. Heights for Mar. 12 to 15 were read to top of ice.

Daily discharge, in second-feet, of Knife River near Broncho, N. Dak., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	5,990	27	27	13	6	17	9	13
2	3,087	27	27	13	6	17	9	13
3	2,131	27	27	13	6	13	9	13
4	1,480	22	22	13	6	13	9	13
5	1,480	22	22	13	6	9	9	13
6	1,480	22	22	13	6	9	9	13
7	861	22	22	13	6	9	9	13
8	627	22	17	13	6	9	9	13
9	502	22	17	13	6	9	9	17
10	417	22	17	13	9	9	9	17
11	210	22	17	13	13	9	9	17
12	156	22	17	13	13	9	13	17
13	103	22	17	13	13	9	13	17
14	90	22	17	13	13	6	13	17
15	78	22	17	13	13	6	13	17
16	78	22	17	13	22	6	13	17
17	48	22	17	13	17	6	13	17
18	40	22	17	13	17	6	13	13
19	40	27	17	13	17	6	13	13
20	40	27	17	13	17	6	13	13
21	40	33	17	13	17	6	13	13
22	40	40	17	13	17	6	13	13
23	33	40	17	13	27	9	13	13
24	33	40	17	13	27	9	13	13
25	33	33	17	9	22	9	13	13
26	33	33	17	9	22	9	13	13
27	27	33	17	6	22	9	13	13
28	27	33	17	6	22	9	13	13
29	27	33	17	6	17	9	13	13
30	27	33	17	6	17	9	13	13
31	.....	33	.....	6	17	.....	13	.....

NOTE.—Discharge determined from a curve fairly-well defined below 2,000 second-feet.

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Monthly discharge of Knife River near Broncho, N. Dak., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	5,990	27	642	38,200	B.
May	40	22	27.4	1,680	B.
June	27	17	18.7	1,110	B.
July	13	6	11.6	713	B.
August	22	6	14.4	885	B.
September	17	6	8.9	530	B.
October	13	9	11.6	713	B.
November	17	13	14.2	845	B.
The period				44,700	

HEART RIVER BASIN.

HEART RIVER NEAR RICHARDTON, N. DAK.

Location.—In or near sec. 21, T. 138 N., R. 92 W., about 11 miles south of Richardton, opposite observer's house, which is 1 mile below highway bridge at which the station was formerly maintained.

Records available.—May 18, 1903, to December 31, 1913.

Drainage area.—1,250 square miles.

Gage.—Overhanging chain gage was installed May 31, 1913, opposite observer's house, at same site and datum as the gage which was used during 1912 and which was destroyed by flood of March 31, 1913.

Control.—Not permanent.

Discharge measurements.—At high stages made from bridge; at ordinary low stages by wading.

Winter flow.—Affected by ice.

Accuracy.—Sufficient high and medium stage measurements have not yet been made to define the upper part of rating curve.

Discharge measurements of Heart River near Richardton, N. Dak., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 13	W. B. Stevenson	25.44	145
May 30	do	24.43	44
Aug. 10	do	23.89	2.1
Sept. 12	do	23.73	.81

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Daily gage height, in feet, of Heart River near Richardton, N. Dak., for 1913.

[W. F. Church, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	39.3	24.5	24.4	24.2	23.85	23.9	23.9	24.1	24.1
2	.....	41.9	24.5	24.4	24.2	23.85	23.85	23.9	24.1	24.1
3	.....	34.3	24.5	24.4	24.2	23.85	23.85	23.95	24.1	24.1
4	.....	32.9	24.5	24.4	24.1	23.8	23.85	23.95	24.1	24.1
5	.....	31.2	24.5	24.3	24.1	23.8	23.8	23.95	24.1	24.1
6	.....	30.9	24.4	24.3	24.1	23.8	23.8	23.95	24.1	24.1
7	.....	30.6	24.4	24.3	24.1	23.8	21.8	23.95	24.1	.....
8	.....	29.9	24.4	24.3	24.1	23.8	23.8	24.0	24.1	.....
9	.....	29.5	24.4	24.3	24.1	23.8	23.75	24.0	24.1	.....
10	.....	28.0	24.4	24.2	24.1	23.9	23.75	24.1	24.1	.....
11	.....	27.6	24.4	24.2	24.15	23.9	23.75	24.1	24.1	.....
12	.....	27.1	24.4	24.2	24.15	23.9	23.75	24.1	24.1	.....
13	.....	26.8	24.4	24.2	24.15	24.1	23.75	24.1	24.1	.....
14	.....	25.2	24.4	24.2	24.1	24.1	23.75	24.05	24.1	.....
15	.....	25.1	24.4	24.2	24.1	24.3	23.7	24.05	24.1	.....
16	.....	25.0	24.4	24.3	24.1	24.3	23.7	24.05	24.1	24.0
17	.....	24.8	24.4	24.25	24.1	24.3	23.7	24.0	24.1	.....
18	.....	24.7	24.4	24.25	24.1	24.3	23.7	24.0	24.1	.....
19	.....	24.7	24.5	24.2	24.1	24.3	23.7	24.0	24.1	.....
20	.....	24.7	24.5	24.2	24.1	24.25	23.7	24.0	24.1	.....
21	.....	24.7	24.55	24.15	24.0	24.2	23.7	24.1	24.1	.....
22	.....	24.7	24.55	24.15	24.0	24.15	23.7	24.1	24.1	.....
23	.....	24.7	24.5	24.15	24.0	24.15	23.75	24.1	24.1	.....
24	.....	24.6	24.5	24.15	24.0	24.1	23.8	24.1	24.1	.....
25	.....	24.6	24.5	24.15	24.0	24.1	23.8	24.1	24.1	.....
26	.....	24.6	24.75	24.15	24.0	24.1	23.85	24.1	24.1	.....
27	.....	24.6	24.7	24.15	23.9	24.0	23.85	24.1	24.1	.....
28	.....	24.6	24.7	24.15	23.9	24.0	23.9	24.1	24.1	.....
29	.....	24.5	24.6	24.2	23.9	24.0	23.9	24.1	24.1	.....
30	25.5	24.5	24.6	24.2	23.9	23.9	23.9	24.1	24.1	.....
31	35.43	.....	24.4	.....	23.85	23.9	.....	24.1	.....	.....

NOTE.—Chain gage was destroyed by flood on Mar. 31. Gage heights Mar. 31 to Apr. 13 read on gage at highway bridge about 1 mile above observer's house. Gage heights Apr. 14 to May 30 observed on a temporary staff gage installed near site of chain gage. On May 31 a chain gage was installed at the same site and datum as the gage which was used during 1912 and which was destroyed by flood Mar. 31, 1913. Gage heights Mar. 31 to May 30 have been referred to gage installed May 31. Discharge relation affected by ice in stream during January, February, March, and Dec. 7–31.

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Daily discharge, in second-feet, of Heart River near Richardton, N. Dak., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3,803	44	36	21	4.5	6	6	15	15
2	.....	4,699	44	36	21	4.5	4.5	6	15	15
3	.....	2,343	44	36	21	4.5	4.5	8	15	15
4	.....	1,910	44	36	15	3	4.5	8	15	15
5	.....	1,406	44	28	15	3	3	8	15	15
6	.....	1,322	36	28	15	3	3	8	15	15
7	.....	1,238	36	28	15	3	3	8	15	.....
8	.....	1,044	36	28	15	3	3	10	15	.....
9	.....	940	36	28	15	3	2	10	15	.....
10	.....	585	36	21	15	6	2	15	15	.....
11	.....	505	36	21	18	6	2	15	15	.....
12	.....	409	36	21	18	6	2	15	15	.....
13	.....	354	36	21	18	15	2	15	15	.....
14	.....	113	36	21	15	15	2	12	15	.....
15	.....	102	36	21	15	28	1	12	15	.....
16	.....	91	36	28	15	28	1	12	15	.....
17	.....	71	36	24	15	28	1	10	15	.....
18	.....	62	36	24	15	28	1	10	15	.....
19	.....	62	44	21	15	28	1	10	15	.....
20	.....	62	44	21	15	24	1	.10	15	.....
21	.....	62	48	18	10	21	1	15	15	.....
22	.....	62	48	18	10	18	1	15	15	.....
23	.....	62	44	18	10	18	2	15	15	.....
24	.....	53	44	18	10	15	3	15	15	.....
25	.....	53	44	18	10	15	3	15	15	.....
26	.....	53	66	18	10	15	4.5	15	15	.....
27	.....	53	62	18	6	10	4.5	15	15	.....
28	.....	53	62	18	6	10	6	15	15	.....
29	.....	44	53	21	6	10	6	15	15	.....
30	45	44	53	21	6	6	6	15	15	.....
31	2,760	.....	36	.....	4.5	6	.....	15	.....	.....

NOTE.—Daily discharge Mar. 30–31, estimated on account of ice. Apr. 1 to Dec. 6, discharge determined from a fairly well-defined curve.

Monthly discharge of Heart River near Richardton, N. Dak., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	4,700	44	725	43,100	B.
May	62	36	43.1	2,650	B.
June	36	18	23.8	1,420	B.
July	21	4	13.4	824	B.
August	28	3	12.5	769	C.
September	6	1	2.88	171	C.
October	15	6	12.0	738	C.
November	15	15	15.0	893	C.
The period	.....	.....	.....	50,600	

CANNONBALL RIVER BASIN.

CANNONBALL RIVER NEAR STEVENSON, N. DAK.

Location.—On the Standing Rock Indian Reservation, near south side of sec. 23, T. 133 N., R. 82 W., at M. H. Burdick's house, immediately above the ford, about 1 mile southeast of the Stevenson schoolhouse and about 5 miles above Timmer, N. Dak. This station is about 1 mile above the gage at the old Stevenson station, at which observations are still occasionally made.

Records available.—June 10, 1903, to November 30, 1908; August 9, 1911, to December 31, 1913.

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Drainage area.—3,670 square miles.

Gages.—Chain on projecting cantilever timber, on west side of river.

Control.—At the rapids 600 feet below the gage the bed is of clean gravel and stones. Bed of stream composed of gravel and stones, in places covered with silt to the depth of 1 foot. During floods the silt may be washed away and later redeposited at some points.

Discharge measurements.—At low and medium stages made by wading at ford 15 rods below the gage or at the riffle 55 rods below; at medium and high stages measurements may be made by use of the car and cable at the old Stevenson station, about 1 mile farther downstream. The discharge is practically the same at the two points, except that a small draw, which enters midway between the gage and the cable on the north side, carries a small flow for a few hours after a rain.

Winter flow.—Affected by ice.

Discharge measurements of Cannonball River near Stevenson, N. Dak., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Apr. 10	W. B. Stevenson.....	15.33	648	Aug. 14	W. B. Stevenson.....	12.54	1.9
June 19	.....do.....	13.10	28	Sept. 16	.....do.....	12.41	.41
Aug. 13	.....do.....	12.50	1.4				

Daily gage height, in feet, of Cannonball River near Stevenson, N. Dak., for 1913.

[Mrs. M. H. Burdick, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	17.25	13.5	13.75	13.23	12.65	12.5	12.5	12.7	12.65
2	14.2	17.75	13.5	13.65	13.25	12.65	12.4	12.55	12.7	12.6
3	14.2	18.35	13.5	13.45	13.25	12.7	12.4	12.5	12.65	12.55
4	14.1	18.65	13.5	13.35	13.35	12.7	12.45	12.5	12.6	12.5
5	14.0	18.2	13.5	13.65	13.25	12.6	12.4	12.6	12.6	12.5
6	14.0	16.7	13.45	13.35	13.35	12.55	12.42	12.7	12.6	12.55
7	14.0	16.65	13.4	13.35	13.3	12.55	12.6	12.8	12.5	12.6
8	14.0	16.25	13.3	13.3	13.15	12.6	12.7	12.8	12.5	12.55
9	13.9	15.82	13.35	13.15	13.1	12.45	12.8	12.9	12.4	12.6
10	13.9	15.3	13.25	13.15	13.05	12.65	12.7	12.8	12.45	12.55
11	14.0	14.95	13.3	13.05	12.95	12.6	12.6	12.7	12.4	12.6
12	14.0	14.65	13.25	13.05	12.95	12.55	12.55	12.65	12.45	12.6
13	14.1	14.6	13.3	12.95	12.9	12.52	12.45	12.6	12.52	12.55
14	14.2	14.45	13.4	12.9	12.95	12.65	12.32	12.6	12.5	12.65
15	14.1	14.3	13.3	12.95	13.05	12.6	12.35	12.6	12.55	12.6
16	14.1	14.3	13.35	13.2	13.2	12.5	12.4	12.55	12.5	12.5
17	14.4	14.6	13.4	13.75	13.35	12.48	12.35	12.5	12.45	12.5
18	14.3	14.5	13.4	13.95	13.5	12.4	12.3	12.5	12.4	12.45
19	14.3	14.2	13.6	13.15	13.15	12.4	12.3	12.45	12.4	12.4
20	14.5	14.05	13.9	12.85	13.05	12.4	12.3	12.4	12.5	.....
21	14.1	14.1	13.8	12.85	12.92	12.5	12.4	12.4	12.5	.....
22	14.2	14.2	13.7	12.85	12.85	12.6	12.45	12.4	12.55	.....
23	14.3	14.05	13.6	12.95	12.90	12.7	12.4	12.35	12.5	.....
24	14.4	13.9	13.5	12.85	12.85	12.82	12.35	12.35	12.55	.....
25	14.3	13.65	13.8	12.90	.....	12.9	12.3	12.55	12.6	.....
26	14.4	13.4	14.4	12.75	12.7	12.95	12.3	12.65	12.65	.....
27	14.5	13.55	14.5	13.15	12.65	12.8	12.3	13.02	12.65	.....
28	14.65	13.6	14.4	13.35	12.65	12.7	12.35	13.0	12.55	.....
29	14.75	13.55	14.3	13.15	12.65	12.65	12.4	12.9	12.5	12.5
30	16.15	13.55	14.1	13.25	12.6	12.6	12.45	12.8	12.6	.....
31	16.4	.....	14.0	.....	12.6	12.55	.....	.....	.....	.....

NOTE.—Ice in stream affected discharge relation Jan. 1 to Mar. 29 and Dec. 19–31.

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Daily discharge, in second-feet, of Cannonball River near Stevenson, N. Dak., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	12	2,345	69	108	37	3	1	1	4	3
2	12	2,860	69	91	39	3	0	1	4	2
3	12	3,500	69	62	39	4	.4	1	3	1
4	7	3,820	69	50	50	4	.7	1	2	1
5	7	3,340	69	91	39	2	.4	2	2	1
6	7	1,790	62	50	50	1	.5	4	2	1
7	7	1,740	56	50	44	1	2	7	1	2
8	7	1,366	44	44	29	2	4	7	1	1
9	7	1,022	50	29	25	.7	7	12	.4	2
10	7	677	39	29	21	3	4	7	.3	1
11	12	491	44	21	15	2	2	4	.4	2
12	18	360	50	21	15	1	1	3	.7	2
13	25	341	44	15	12	1	.7	2	1	1
14	35	288	56	12	15	3	.2	2	1	3
15	25	241	44	15	21	2	.3	2	1	2
16	25	241	50	34	34	1	.4	1	1	1
17	56	341	56	108	50	.9	.3	1	1	1
18	44	305	56	148	69	.4	.2	1	.4	.4
19	44	212	83	29	29	.4	.2	.7	.4	.4
20	69	172	137	9	21	.4	.2	.4	1	.....
21	25	185	117	9	13	1	.4	.4	1	.....
22	35	212	99	9	9	2	.7	.4	1	.....
23	44	172	83	15	12	4	.4	.3	1	.....
24	56	137	69	9	9	8	.3	.3	1	.....
25	44	91	117	12	6	12	.2	1	2	.....
26	56	56	272	5	4	15	.2	3	2	.....
27	69	76	305	29	3	7	.2	19	3	.....
28	91	83	272	50	3	4	.3	18	1	.....
29	108	76	241	29	3	3	.4	12	1	.....
30	1,453	76	185	39	2	2	.7	7	2	.....
31	1,690	.....	160	.....	2	1	.....	5	.....	.....

NOTE.—Discharge Mar. 1-29 estimated on account of ice. Discharge Mar. 31 to Dec. 19 determined from a curve that is fairly well defined between gage heights 13 and 19 feet.

Monthly discharge of Cannonball River near Stevenson, N. Dak., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March	1,690	7	133	8,180	D.
April	3,820	56	887	52,800	B.
May	305	39	101	6,210	B.
June	148	5	40.7	2,420	B.
July	69	2	23.2	1,430	B.
August	15	.4	3.06	188	B.
September	7	.2	.99	59	C.
October	19	.3	4.08	251	C.
November	4	.3	1.42	84	C.
The period	.....	.....	.....	71,600	

GRAND RIVER BASIN.

NORTH BRANCH OF GRAND RIVER AT HALEY, N. DAK.

Location.—About 20 rods south of the post office at Haley, N. Dak., near northeast corner of sec. 36, T. 129 N., R. 100 W.

Records available.—May 17, 1908, to December 31, 1913.

Drainage area.—500 square miles.

Gage.—Gage heights are obtained by measuring distance from bench mark to water surface by means of a metallic tape weighted at the end.

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Channel.—Bed of stream composed of gravel and silt.

Discharge measurements.—At high stages made from car and cable 200 feet below gage; at low stages by wading.

Winter flow.—Affected by ice.

Accuracy.—Results fair except for low stages, when the percentage error is very large.

Discharge measurements of North Branch of Grand River at Haley, N. Dak., in 1913.

[H. N. Lungwitz, hydrographer.]

Date.	Time.	Gage height.	Discharge.	Date.	Time.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 31	8 a. m.	9.65	5,460	Apr. 2	5 p. m.	5.65	506
31	12 m.	9.85	5,810	3	9 a. m.	4.05	292
Apr. 1	9 a. m.	7.95	2,040	3	3 p. m.	3.85	270
1	11 a. m.	7.65	1,760	4	9 a. m.	3.15	218
1	2 p. m.	7.35	1,550	4	5 p. m.	2.75	215
1	5 p. m.	7.25	1,460	5	6 p. m.	2.55	144
2	9 a. m.	5.55	620	[a]Aug. 15	3 p. m.	.69	.21
2	2 p. m.	5.35	562				

[a] Measurement made by W. B. Stevenson.

Daily gage height, in feet, of North Branch of Grand River at Haley, N. Dak., for 1913.

[H. N. Lungwitz, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Nov.	Dec.
1	0.8	0.7	.....	7.55	0.9	0.8	0.8	0.8	0.8	0.7	0.7
2	.....	.8	.....	5.55	.9	.8	.8	.8	.8	.7	.7
3	.....	.8	.....	3.9	.9	.8	.8	.8	.8	.7	.7
4	.....	.8	.....	2.85	.9	.8	.8	.8	.8	.7	.7
5	.....	.8	.....	2.55	.9	.8	.8	.8	.8	.7	.7
6	.....	.8	.....	2.35	.9	.8	.8	.8	.8	.7	.7
7	.....	.8	.....	2.2	.9	.8	.8	.8	.8	.7	.7
8	.....	.8	.....	1.95	.9	.8	.8	.8	.8	.7	.....
9	.....	.....	.....	1.85	.9	.8	.8	.8	.8	.7	.....
10	.....	1.1	1.1	1.75	.9	.8	.8	.8	.8	.7	.....
11	.....	.....	1.1	1.6	.8	.8	.8	.8	.8	.7	.....
12	.8	.....	1.1	1.45	.8	.8	.8	.8	.7	.7	.....
13	.8	.....	1.1	1.35	.8	.8	.8	.8	.7	.7	.....
14	.8	.....	1.1	1.2	.8	.8	1.1	.8	.7	.7	.....
15	.8	.....	1.1	1.1	.8	.8	2.25	.8	.7	.7	.....
16	.8	.....	.....	1.0	.8	.8	2.15	.8	.7	.7	.....
17	.8	.....	.....	.9	.8	.8	.8	.8	.7	.7	.....
18	.8	.....	.....	.9	.8	.8	.8	.8	.7	.7	.....
19	.8	.....	.....	.9	.8	.8	.8	.8	.7	.7	.....
20	.8	.....	.....	.9	.8	.8	.8	.8	.7	.7	.....
21	.8	.....	.....	.9	.8	.8	.8	.8	.7	.7	.....
22	.7	.....	.....	.9	.8	.8	.8	.8	.7	.7	.....
23	.7	.....	1.1	.9	.8	.8	.8	.8	.7	.7	.....
24	.7	.....	1.1	.9	.8	.8	.8	.8	.7	.7	.....
25	.7	.....	1.1	.9	.8	.8	.8	.8	.7	.7	.....
26	.7	.....	1.1	.9	.8	.8	.8	.8	.7	.7	.....
27	.7	.....	1.1	.9	.8	.8	.8	.8	.7	.7	.....
28	.7	.....	1.1	.9	.8	.8	.8	.8	.7	.7	.....
29	.7	.....	1.1	.9	.8	.8	.8	.8	.7	.7	.....
30	.7	.....	2.0	.9	.8	.8	.8	.8	.7	.7	.....
31	.7	.....	9.85	.....	.....	.....	.8	.8	.....	.7	.....

NOTE.—Discharge relation affected by ice Jan. 1 to Mar. 29 and Nov. 8 to Dec. 31.

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Daily discharge, in second-feet, of North Branch of Grand River at Haley, N. Dak., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	2,040	3	1	1	1	1	0.3
2	.....	562	3	1	1	1	1	.3
3	.....	281	3	1	1	1	1	.3
4	.....	215	3	1	1	1	1	.3
5	.....	144	3	1	1	1	1	.3
6	.....	90	3	1	1	1	1	.3
7	.....	77	3	1	1	1	1	.3
8	.....	56	3	1	1	1	1	.3
9	.....	48	3	1	1	1	1	.3
10	.....	42	3	1	1	1	1	.3
11	.....	32	1	1	1	1	1	.3
12	.....	24	1	1	1	1	.3	.3
13	.....	18	1	1	1	1	.3	.3
14	.....	12	1	1	1	1	.3	.3
15	.....	8	1	1	1	1	.3	.3
16	.....	5	1	1	1	1	.3	.3
17	.....	3	1	1	1	1	.3	.3
18	.....	3	1	1	1	1	.3	.3
19	.....	3	1	1	8	1	.3	.3
20	.....	3	1	1	81	1	.3	.3
21	.....	3	1	1	72	1	.3	.3
22	.....	3	1	1	1	1	.3	.3
23	.....	3	1	1	1	1	.3	.3
24	.....	3	1	1	1	1	.3	.3
25	.....	3	1	1	1	1	.3	.3
26	.....	3	1	1	1	1	.3	.3
27	.....	3	1	1	1	1	.3	.3
28	.....	3	1	1	1	1	.3	.3
29	.....	3	1	1	1	1	.3	.3
30	60	3	1	1	1	1	.3	.3
31	4,800	.....	1	.....	1	1	.....	.3

NOTE.—Daily discharge Apr. 6 to Oct. 31 determined from a curve poorly defined below 250 second-feet. Discharge Mar. 31 and Apr. 1-5 estimated from current meter measurements made on those days.

Monthly discharge of North Branch of Grand River at Haley, N. Dak., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	2,040	3	123	7,330	B.
May	3	1	1.65	101	D.
June	1	1	1.00	60	D.
July	81	1	6.06	373	C.
August	1	1	1.00	62	D.
September	1	.3	.56	33	D.
October	.3	.3	.30	18	D.
The period	.....	.....	.....	7,980	

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GRAND RIVER NEAR WAKPALA, S. DAK.

Location.—On the Standing Rock Indian Reservation, a new steel highway bridge, 4 miles south of Wakpala, S. Dak., a station on Chicago, Milwaukee & St. Paul Railway, in or near sec. 8, T. 19 N., R. 29 E.

Records available.—September 9, 1911, to December 31, 1913.

Drainage area.—5,300 square miles.

Gage.—Standard chain gage on foot guardrail at downstream side of highway bridge.

Control.—Shifting; bed composed of soft silt or quicksand.

Discharge measurements.—Made from highway bridge; at very low stages measurements may be made by wading at the ford 40 rods below the bridge.

Accuracy.—Results poor, owing to infrequency of gage readings and measurements and shifting character of the stream.

Discharge measurements of Grand River near Wakpala, S. Dak., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 9	W. B. Stevenson	6.11	836	Aug. 17	W. B. Stevenson	3.10	22.6
June 18	do	4.42	188	Sept. 17	do	2.32	0.18
Aug. 16	do	3.29	34	Nov. 1	O. Christianson	2.70	13

Daily gage height, in feet, of Grand River near Wakpala, S. Dak., for 1913.

[George Baine, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1				5.8	3.1		2.1	2.7
2	7.6							
3	12.9							
4						2.4	2.3	
5	12.9		3.75	4.35	3.15			
6			3.85	4.35		2.5		
7			2.75				3.9	
8		3.35			2.95			
9	6.11			4.15			4.0	
10			4.15			2.3		
11							3.2	
12		3.25		3.55	3.55			
13	5.05	3.35				2.2	3.1	
14		3.25	3.55					
15								
16		3.25			3.3			
17				3.5	3.1	2.0		
18	4.25		4.4		2.9		2.9	
19			4.2	3.4		2.0		
20			4.1					
21		3.55		3.35				
22					3.0			
23			4.0				2.9	
24		4.15		4.45		1.8		
25					2.7		2.8	
26		3.85	4.5					
27						2.0		
28			6.3			2.2		
29			6.1					
30			5.8	3.8	2.5	2.1		
31		3.85						

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Daily discharge, in second-feet, of Grand River near Wakpala, S. Dak., for 1914.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	600	80	90	670	22	2	0.1	13
2	1,300	70	90	565	24	2	.1	.....
3	3,160	70	80	425	26	1	.2	.....
4	3,160	60	80	252	29	1	.2	.....
5	3,160	60	80	180	32	1.5	12	.....
6	2,560	50	90	180	25	2	36	.....
7	1,970	50	80	160	20	1.2	96	.....
8	1,380	40	100	144	15	1	108	.....
9	780	40	120	136	20	1	110	.....
10	690	40	140	136	25	.2	54	.....
11	590	30	120	57	37	.2	28	.....
12	500	30	100	57	57	.1	25	.....
13	410	40	80	57	57	.1	22	.....
14	360	30	60	57	47	.1	22	.....
15	310	30	90	53	40	.1	18	.....
16	260	30	120	52	35	.2	17	.....
17	210	30	160	52	22	.2	15	.....
18	160	40	190	48	13	.2	13	.....
19	150	40	140	43	13	.2	13	.....
20	150	50	130	41	15	.2	13	.....
21	140	60	120	39	17	.1	13	.....
22	140	90	120	43	17	.1	13	.....
23	130	110	110	110	12	.1	13	.....
24	130	140	150	206	8	.1	10	.....
25	120	120	180	176	6	.1	9	.....
25	110	90	220	151	6	.1	10	.....
27	110	90	530	130	4	.1	10	.....
28	100	90	840	111	3	.1	11	.....
29	90	90	780	93	2	.1	12	.....
30	90	90	670	84	2	.1	12	.....
31	.....	90	.....	60	2	.....	12	.....

NOTE.—Discharge determined from a fairly well defined curve. Discharge interpolated or estimated for days for which gage heights are missing.

Monthly discharge of Grand River near Wakpala, S. Dak., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	3,160	90	767	45,700	D.
May	140	30	64.0	3,910	C.
June	840	60	195	11,600	C.
July	670	39	147	9,460	C.
August	57	2	21.1	1,300	B.
September	2	.1	.52	31	D.
October	110	.1	23.3	1,430	C.
The period	.....	.....	.....	73,400	

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CHEYENNE RIVER BASIN.

BELLE FOURCHE RIVER NEAR BELLEFOURCHE, S. DAK.

Location.—At the diversion dam of the Belle Fourche irrigation project, in sec. 2, T. 8 N., R. 2 E., 1½ miles below Bellefourche.

Records available.—May 10 to November 30, 1906; January 1, 1912, to December 31, 1913. From May 26, 1903, to June 23, 1906, a station was maintained at the western edge of Bellefourche. The records at the two points are not directly comparable, as Redwater River enters between and water is diverted from Belle Fourche River.

Drainage area.—4,270 square miles.

Gage.—An inclined staff situated 300 feet below the diversion dam shows the flow passing the diversion dam.

Cooperation.—Station maintained and records furnished by United States Reclamation Service.

Daily discharge, in second-feet, of Belle Fourche River near Bellefourche, S. Dak., for 1913.

[William Francisco, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	260	260	330	5,450	450	220	755	185	95	490	275	245
2	260	260	400	5,450	450	220	755	185	95	490	275	245
3	260	260	400	4,180	450	600	450	185	95	490	275	245
4	260	260	400	2,720	442	220	450	185	95	490	275	245
5	260	260	475	2,720	430	280	400	185	95	512	275	245
6	260	260	475	2,720	430	220	300	185	95	420	275	245
7	260	260	475	2,190	430	220	200	185	94	400	275	245
8	260	260	550	1,250	320	450	200	1,350	150	350	275	245
9	260	260	850	1,570	420	380	200	620	185	320	275	245
10	260	260	2,120	1,360	405	290	185	400	200	320	275	245
11	260	260	1,720	1,267	320	290	185	320	210	320	275	245
12	260	260	1,250	970	160	260	170	280	220	320	275	245
13	260	260	1,250	970	635	335	120	240	220	320	270	245
14	260	330	1,040	970	305	290	130	210	220	320	270	245
15	260	330	1,040	970	325	275	150	210	280	320	270	245
16	260	400	625	1,120	305	220	150	280	1,580	320	270	245
17	260	587	475	1,270	290	220	160	200	1,360	320	270	245
18	260	555	475	1,195	290	185	160	160	1,825	320	270	245
19	260	400	475	1,020	290	185	100	150	900	320	270	245
20	260	330	475	1,040	290	185	100	100	630	320	270	245
21	260	320	475	870	290	220	100	100	460	320	270	245
22	260	330	475	870	290	970	95	95	380	320	270	245
23	260	400	475	795	230	755	100	95	360	320	260	245
24	260	400	475	795	225	755	100	95	320	320	260	245
25	260	400	550	720	205	445	160	95	500	320	260	245
26	260	320	550	650	205	355	170	95	620	320	250	245
27	260	320	550	650	205	355	170	95	530	320	245	245
28	260	320	550	580	160	355	170	95	531	320	245	245
29	260	.....	700	515	220	1,697	177	95	540	320	245	245
30	260	.....	1,720	450	220	1,040	185	95	490	320	245	245
31	260	.....	2,725	.....	220	.....	250	95	.....	320	.....	245

NOTE.—Records show the combined flow of the river and canal at the diversion dam.

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Monthly discharge of Belle Fourche River near Bellefourche, S. Dak., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	260	260	260	16,000	C.
February	587	260	326	18,100	C.
March	2,720	330	792	48,700	B.
April	5,450	450	1,580	94,000	B.
May	635	160	320	19,700	B.
June	1,700	185	416	24,800	B.
July	755	95	226	13,900	B.
August	1,350	95	221	13,600	B.
September	1,820	94	446	26,500	B.
October	512	320	355	21,800	B.
November	275	245	267	15,900	B.
December	245	245	245	15,100	C.
The year	5,450	94	454	328,000	

NOTE.—Estimates as furnished have been changed slightly to conform to the standard computation rules of United States Geological Survey.

WHITE RIVER BASIN.

WHITE RIVER NEAR INTERIOR, S. DAK.

Location.—On the Pine Ridge Indian Reservation, at steel highway bridge near southwest corner of sec. 7, T. 4 S., R. 18 E., where the county line between Stanley and Pennington counties intersects White River, 3 miles southwest of Interior, S. Dak., a station on Chicago, Milwaukee & St. Paul Railway.

Records available.—June 24, 1904, to November 30, 1906, at old station in T. 3 S., R. 18 E.; August 24, 1911, to December 31, 1913.

Drainage area.—4,090 square miles. The area above present site is about 15 square miles less than area above the station maintained during 1904–1906.

Gage.—A vertical rod attached to lower side of first pier (nearest the shore) at left end of the bridge, installed August 31, 1911, and supposed to read the same as the temporary rod gage which was placed August 24 on a tree on left bank at turn of the river near southwest corner of NW. ¼ sec. 17.

Control.—Probably changes gradually; bed composed of sand and some quicksand; left bank steep and clean; right bank gently sloping and clean; current, medium. At low stages all the water may pass under one span (67-foot); at highest stage the water passes under two 67-foot spans and 120 feet of trestle approach, but probably two-thirds of the flow passes under the two spans.

Discharge measurements.—Made from highway bridge.

Winter flow.—Relation of gage height to discharge probably affected by ice during January, February, March, and December.

Accuracy.—Results fair.

Discharge measurements of White River near Interior, S. Dak., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 6	W. B. Stevenson	6.42	2,130	Aug. 21	W. B. Stevenson	3.98	96
June 14	do	6.27	1,650	Sept. 20	do	3.68	40
15	do	5.11	523	Oct. 28	O. Christianson	3.50	6.2
Aug. 20	do	4.11	144				

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Daily gage height, in feet, of White River near Interior, S. Dak., for 1913.

[H. Thompson and George Carlbom, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	5.9	4.0	6.0	3.5	3.2	3.3	3.41	3.68	3.62
2	.....	5.8	3.9	6.1	3.5	3.2	3.25	3.4	3.68	3.66
3	.....	5.9	3.8	6.75	3.5	3.2	3.22	3.4	3.65	3.9
4	5.0	6.1	3.8	7.45	3.5	3.2	4.02	3.4	3.7	3.95
5	5.4	6.3	3.8	6.6	3.4	3.2	3.98	4.2	3.65	4.45
6	5.6	6.3	3.8	6.0	3.4	3.2	3.66	4.42	4.0	4.4
7	5.4	6.2	3.7	5.5	3.3	3.3	3.88	4.4	4.1	3.95
8	5.3	6.0	3.7	4.9	3.3	3.3	3.65	4.1	3.92	3.78
9	5.2	5.5	3.8	4.4	3.3	3.3	3.55	3.78	3.75	3.9
10	5.1	5.1	3.8	4.4	5.5	6.0	3.45	3.8	3.70	3.96
11	5.1	5.9	3.9	4.4	4.9	5.6	3.32	3.78	3.65	3.94
12	5.0	5.9	3.9	4.4	3.9	5.0	3.18	3.6	3.63	4.1
13	5.0	5.8	6.0	4.7	3.5	4.9	3.3	3.75	3.6	3.98
14	4.8	5.4	6.95	8.0	3.4	5.0	3.3	3.62	3.6	.....
15	4.8	5.0	6.0	5.6	3.4	5.1	3.38	3.6	3.6	.....
16	4.8	4.9	5.3	4.6	3.4	5.4	3.75	3.6	3.6	.....
17	4.9	4.9	4.8	4.2	3.4	6.0	4.7	3.6	3.6	.....
18	4.9	4.7	4.4	4.1	3.4	5.5	4.68	3.59	3.62	.....
19	4.8	4.6	4.1	4.1	5.9	5.0	4.0	3.58	3.62	.....
20	4.8	4.6	4.1	4.0	5.6	4.5	3.7	3.58	3.62	3.9
21	4.8	4.5	4.0	4.0	4.9	4.0	3.52	3.58	3.62	.....
22	4.8	4.8	4.0	3.9	4.1	3.92	3.5	3.58	3.63	.....
23	4.8	4.8	4.0	3.9	3.9	3.85	3.48	3.58	3.7	.....
24	4.8	4.5	3.9	3.9	3.6	3.65	3.65	3.6	3.68	.....
25	4.8	4.3	3.9	3.9	3.4	3.52	3.75	3.6	3.66	.....
26	4.8	4.2	3.9	3.8	3.6	3.5	3.58	3.6	3.64	.....
27	4.8	4.0	4.0	3.8	3.6	3.55	3.52	3.6	3.65	.....
28	4.9	4.0	4.0	3.6	3.4	3.42	3.5	3.68	3.66	.....
29	4.9	4.0	5.0	3.6	3.3	3.42	3.46	3.7	3.65	.....
30	5.0	4.1	4.5	3.5	3.2	3.45	3.4	3.7	3.62	.....
31	5.4	.....	4.5	.....	3.2	3.42	.....	3.69	.....	.....

NOTE.—Discharge relation affected by ice Mar. 4–31 and Dec. 3–31. After Aug. 20 gage record may be assumed to be more accurate, owing to fact that new observer lives nearer the gage and can note sudden changes.

Daily discharge, in second-feet, of White River near Interior, S. Dak., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	5	1,250	105	1,370	26	13	16	20	19	35
2	5	1,140	75	1,500	26	13	14	20	19	38
3	7	1,250	55	2,630	26	13	14	20	23	33
4	10	1,500	55	3,745	26	13	111	20	33	30
5	20	1,790	55	2,290	20	13	100	170	38	90
6	33	1,790	55	1,370	20	13	39	248	105	55
7	20	1,640	42	850	16	16	71	240	135	18
8	16	1,370	42	460	16	16	38	135	81	15
9	12	850	55	240	16	16	30	53	48	20
10	10	565	55	240	850	1,370	23	55	42	38
11	10	1,250	75	240	460	940	17	53	38	36
12	7	1,250	75	240	75	510	12	33	36	20
13	7	1,140	1,370	365	26	460	16	48	33	15
14	7	765	2,885	4,720	20	510	16	35	33	15
15	7	510	1,370	940	20	565	19	33	33	15
16	7	460	690	320	20	765	48	33	33	.....
17	10	460	410	170	20	1,370	365	33	33	.....
18	10	365	240	135	20	850	356	32	35	.....
19	7	320	135	135	1,250	510	105	32	35	.....
20	7	320	135	105	940	280	42	32	35	.....
21	13	280	105	105	460	105	29	32	35	.....
22	13	410	105	75	135	81	26	32	36	.....
23	13	410	105	75	75	65	25	32	42	.....
24	13	280	75	75	33	38	38	33	41	.....
25	13	205	75	75	20	27	48	33	39	.....
26	16	170	75	55	33	26	32	33	37	.....
27	16	105	105	55	33	30	27	20	38	.....
28	20	105	105	33	20	21	26	19	39	.....
29	20	105	510	33	16	21	24	20	38	.....
30	26	135	280	26	13	23	20	20	35	.....
31	240	.....	280	.....	13	21	.....	19	.....	.....

NOTE.—Discharge Mar. 1–31 and Dec. 3–31 estimated on account of ice. Mean discharge Dec. 16 to 31 estimated at 14 second-feet. Discharge Apr. 1 to Dec. 2 determined from a fairly well defined curve.

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Monthly discharge of White River near Interior, S. Dak., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March			20.0	1,230	D.
April	1,790	105	740	44,000	B.
May	2,880	42	316	19,400	B.
June	4,720	26	756	45,000	B.
July	1,250	13	153	9,410	B.
August	1,370	13	281	17,300	B.
September	365	12	58.2	3,460	B.
October	248		52.8	3,250	B.
November	135		42.2	2,510	B.
December	90		22.5	1,380	C.
The period				147,000	

WHITE RIVER NEAR WESTOVER, S. DAK.

Location.—In sec. 32, T. 3 S., R. 29 E., on the Rosebud Indian Reservation at steel highway bridge near Westover about 12 miles south and slightly east from Murdo, S. Dak., a station on Chicago, Milwaukee & St. Paul Railway, and about 1 mile below entrance of Little White River; about 40 rods above location of original station, established in 1911.

Records available.—August 25, 1911, to December 31, 1913.

Drainage area.—7,850 square miles.

Gage.—Standard chain gage on steel highway bridge. Gage zero is 2.0 feet higher than zero of original gage installed in 1911. August 18, 1913, a staff gage reading same as chain gage was fastened to downstream face of left abutment. This gage was installed in order to obtain more frequent and accurate readings.

Control.—Composed of sand and silt; likely to scour and fill at flood stages.

Discharge measurements.—Made from highway bridge.

Winter flow.—Affected by ice.

Discharge measurements of White River near Westover, S. Dak., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 7	W. B. Stevenson	9.88	4,529	Aug. 19	W. B. Stevenson	8.18	889
June 15	do	9.48	3,373	Sept. 18	do	6.98	155
16	do	8.67	1,673	Oct. 30	O. Christianson	6.96	82
Aug. 18	do	8.81	1,940				

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Daily gage height, in feet, of White River near Westover, S. Dak., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	8.2	8.5	7.0	6.9	6.7	7.0	6.9	7.2
2	.....	.....	8.2	8.3	7.0	6.9	6.7	7.0	6.9	7.2
3	.....	9.0	8.2	8.9	7.0	6.9	6.7	7.0	6.9	7.2
4	.....	.....	8.2	9.9	6.9	6.9	6.7	7.0	6.9	7.3
5	.....	.....	8.1	9.5	7.0	6.9	6.7	6.9	6.9	7.3
6	.....	.....	8.0	8.3	6.9	6.9	6.7	6.9	6.9	7.3
7	.....	10.2	8.0	8.9	7.0	6.9	6.7	7.0	6.9	7.4
8	.....	.....	7.8	8.9	7.0	6.9	6.65	7.6	6.9	7.4
9	.....	.....	7.8	8.4	6.9	6.8	6.65	7.5	6.9	7.5
10	.....	.....	7.9	7.9	6.9	6.8	6.6	7.2	6.8	7.7
11	.....	8.5	8.0	7.7	7.5	6.8	6.6	7.0	6.8	7.7
12	9.0	8.0	6.9	8.3	7.4	6.9	6.6	7.0	6.8	7.7
13	.....	10.0	6.9	7.7	7.5	6.9	6.6	7.0	6.8	7.7
14	.....	10.9	6.9	7.3	7.6	7.5	6.6	7.0	6.8	7.7
15	.....	9.5	7.0	8.9	7.5	7.3	6.6	7.0	6.8	7.9
16	.....	9.6	10.0	8.8	8.0	7.3	6.6	7.0	6.8	7.9
17	.....	7.9	9.0	8.3	7.7	7.2	6.6	6.9	6.8	7.9
18	.....	8.0	9.0	7.9	7.4	9.9	7.0	6.9	6.8	7.9
19	.....	8.3	8.5	7.8	7.3	9.0	7.2	6.9	6.8	7.9
20	.....	8.4	8.3	7.6	7.2	8.6	7.7	6.9	6.9	7.9
21	.....	7.2	8.2	7.5	7.5	8.1	7.6	6.9	6.9	7.9
22	.....	7.0	8.1	7.3	7.5	7.8	7.4	6.9	6.9	8.0
23	.....	7.6	8.1	7.0	7.5	7.6	7.2	6.9	7.0	.....
24	.....	7.3	8.1	7.0	7.4	7.4	7.2	6.9	7.0	.....
25	.....	7.2	7.7	6.8	7.3	7.0	7.1	6.9	7.1	.....
26	.....	7.1	7.7	7.4	7.2	6.9	7.0	6.9	7.0	.....
27	.....	7.9	7.5	7.3	7.1	6.9	7.0	6.9	7.0	.....
28	.....	8.4	7.4	7.3	7.0	6.7	7.0	6.9	7.0	.....
29	.....	8.4	7.8	7.1	6.9	6.7	6.9	6.9	7.0	.....
30	.....	8.3	7.7	7.0	6.9	6.7	6.8	6.9	7.0	.....
31	.....	.....	.....	.....	6.9	6.7	.....	6.9	.....	.....

NOTE.—Discharge relation probably affected by ice during January, February, March, and December.

Daily discharge, in second-feet, of White River near Westover, S. Dak., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	655	970	1,230	193	166	118	193	166
2	1,230	970	1,095	193	166	118	193	166
3	2,290	970	2,075	193	166	118	193	166
4	2,980	970	4,360	166	166	118	193	166
5	3,670	855	3,440	193	166	118	166	166
6	4,360	750	1,095	193	166	118	166	166
7	5,050	750	2,075	193	166	118	193	166
8	3,900	570	2,075	193	166	108	430	166
9	2,980	570	1,230	166	141	108	375	166
10	2,075	655	655	166	141	97	254	141
11	1,375	750	495	375	141	97	193	141
12	750	166	1,095	330	166	97	193	141
13	4,590	166	495	375	166	97	193	141
14	6,660	166	290	430	375	97	193	141
15	3,440	193	2,075	375	290	97	193	141
16	3,670	4,590	1,875	750	290	97	193	141
17	655	2,290	1,095	495	254	97	166	141
18	750	2,290	655	330	4,360	193	166	141
19	1,095	1,375	570	290	2,290	254	166	141
20	1,230	1,095	430	254	1,530	495	166	166
21	254	970	375	375	855	430	166	166
22	193	855	290	375	570	330	166	166
23	430	855	193	375	430	254	166	193
24	290	855	193	330	330	254	166	193
25	254	495	141	290	193	222	166	222
26	222	495	330	254	166	193	166	193
27	655	375	290	222	166	193	166	193
28	1,230	330	290	193	118	193	166	193
29	1,230	570	222	166	118	166	166	193
30	1,095	495	193	166	118	141	166	193
31	.....	862	.....	166	118	.....	166	.....

NOTE.—Discharge determined from a fairly well-defined curve. Discharge interpolated on days for which gage heights are missing.

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Monthly discharge of White River near Westover, S. Dak., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	6,660	193	1,980	118,000	D
May	4,590	166	912	56,100	C.
June	4,360	141	1,030	61,300	C.
July	750	169	283	17,400	C.
August	4,360	118	473	29,100	B.
September	495	97	171	10,200	B.
October	430	166	194	11,900	C.
November	222	141	166	9,870	D.
The period				314,000	

LITTLE WHITE RIVER NEAR WESTOVER, S. DAK.

Location.—At C. H. Kendall's ranch, on the Rosebud Indian Reservation, about 4 miles south of Westover and about 2 miles above mouth of the stream.

Records available.—June 26, 1912, to December 31, 1913.

Drainage area.—1,590 square miles.

Gage.—Standard projecting timber chain gage installed September 18, 1913, about 5 or 6 rods below the cable and on right bank. A staff gage about 10 rods below cable was used during 1913 prior to September 18. A staff gage about 30 rods below the cable was used during 1912. All gages have been referred to the same datum.

Control.—Sandy and shifting.

Discharge measurements.—Made from the cable or by wading.

Winter flow.—Affected by ice.

Accuracy.—Gage heights for 1913 considered more accurate than those for 1912, owing to better position of gages. As sufficient measurements were obtained to define a curve, results should be fair.

Discharge measurements of Little White River near Westover, S. Dak., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 8	W. B. Stevenson	2.89	645	Sept. 19	W. B. Stevenson	1.86	2
June 16	do	1.99	78	Oct. 30	O. Christianson	2.09	109
Aug. 19	do	1.98	58				

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Daily gage height, in feet, of Little White River near Westover, S. Dak., for 1913.

[Mrs. C. H. Kendall, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	3.3	2.0	2.0	1.95	1.9	1.9	1.9	2.0	2.2
2	.....	.....	.....	3.2	2.0	2.0	1.95	1.9	1.9	1.9	2.1	2.5
3	.....	.....	.....	3.3	2.0	.....	1.95	1.9	1.95	1.9	2.1	2.5
4	.....	.....	.....	3.3	.....	2.02	.....	1.9	1.9	1.9	.....	2.5
5	2.9	.....	.....	3.3	2.1	2.0	1.95	1.9	1.9	1.9	2.1	2.4
6	2.9	.....	.....	.....	2.1	2.0	1.95	1.9	1.9	1.9	2.1	2.5
7	2.9	.....	2.6	.....	.....	2.0	1.95	1.9	1.9	1.9	2.1	2.45
8	2.9	.....	2.5	2.9	2.1	.....	1.95	1.9	1.9	1.9	2.1	2.45
9	2.9	.....	.....	2.9	2.0	2.0	1.95	1.9	1.9	1.9	2.1	2.45
10	2.9	.....	.....	2.95	2.0	2.0	2.2	1.95	1.9	.....	2.1	2.4
11	2.9	.....	.....	2.85	2.2	2.0	2.25	1.92	1.9	1.9	2.1	2.4
12	.....	2.9	.....	2.4	2.1	2.0	2.4	1.9	1.9	.....	2.14	2.4
13	.....	2.95	.....	2.5	2.1	2.0	2.0	1.9	1.9	1.9	2.12	2.4
14	.....	2.95	.....	2.7	2.2	2.0	2.0	1.9	1.9	.....	2.1	2.4
15	.....	2.95	.....	.....	2.0	2.0	2.0	1.9	1.92	1.9	2.1	2.4
16	.....	.....	.....	2.7	2.0	2.0	2.0	1.9	1.9	1.9	2.1	2.4
17	.....	.....	.....	2.6	2.0	2.1	2.55	1.9	1.9	1.9	2.12	2.45
18	.....	.....	.....	2.6	2.0	2.05	2.3	1.9	.....	.....	2.2	2.5
19	.....	.....	.....	2.4	.....	2.0	2.0	2.0	1.9	1.9	2.2	2.5
20	.....	.....	.....	.....	2.0	2.0	1.95	1.9	1.9	1.9	2.2	2.5
21	.....	.....	.....	2.4	2.05	2.2	1.9	1.8	1.9	1.9	2.2	.....
22	.....	.....	.....	2.3	2.0	2.2	1.9	1.8	1.9	1.9	2.2	2.5
23	2.9	.....	.....	2.3	2.0	2.1	1.9	1.75	1.9	1.9	2.2	2.5
24	2.9	.....	.....	2.4	2.0	2.0	2.1	1.9	1.9	1.9	2.22	2.5
25	2.95	.....	.....	2.6	.....	2.0	2.0	1.9	1.9	1.9	2.22	2.5
26	2.9	.....	.....	2.6	2.1	2.0	2.0	1.9	1.9	1.95	2.2	2.5
27	2.95	.....	.....	.....	2.2	2.05	.....	1.95	1.9	1.95	2.2	2.45
28	2.95	.....	3.2	2.0	2.2	2.05	1.95	1.9	1.9	2.0	2.2	2.6
29	2.9	.....	3.3	2.0	2.7	.....	1.9	1.9	1.9	.....	2.18	2.7
30	.....	.....	3.3	2.0	2.7	2.08	1.9	1.9	1.9	2.0	.....	3.0
31	.....	.....	3.4	.....	2.58	.....	1.9	.....	.....	2.0	.....	3.0

NOTE.—Discharge relation probably affected by ice during January, February, March, and December.

Daily discharge, in second-feet, of Little White River near Westover, S. Dak., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	962	75	75	62	49	49	49	75
2	884	75	75	62	49	49	49	113
3	962	75	75	62	49	62	49	113
4	962	94	83	62	49	49	49	113
5	962	113	75	62	49	49	49	113
6	962	113	75	62	49	49	49	113
7	807	113	75	62	49	49	49	113
8	653	113	75	62	49	49	49	113
9	653	75	75	62	49	49	49	113
10	691	75	75	161	62	49	49	113
11	614	161	75	189	54	49	49	113
12	281	113	75	281	49	49	49	132
13	349	113	75	75	49	49	49	123
14	499	161	75	75	49	49	49	113
15	499	75	75	75	49	54	49	113
16	499	75	75	75	49	49	49	113
17	422	75	113	385	49	49	49	123
18	422	75	94	217	49	49	49	161
19	281	75	75	75	75	49	49	161
20	281	75	75	62	49	49	49	161
21	281	94	161	49	35	49	49	161
22	217	75	161	49	35	49	49	161
23	217	75	113	49	31	49	49	161
24	281	75	75	113	49	49	49	172
25	422	75	75	75	49	49	49	172
26	422	113	75	75	49	49	62	161
27	217	161	94	75	62	49	62	161
28	75	161	94	62	49	49	75	161
29	75	499	100	49	49	49	75	151
30	75	499	105	49	49	49	75	161
31	.....	407	.....	49	49	.....	75	.....

NOTE.—Discharge determined from a fairly well defined curve.

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Monthly discharge of Little White River near Westover, S. Dak., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	962	75	498	29,600	B.
May	499	75	134	8,240	B.
June	161	75	87.3	5,190	B.
July	385	49	94.3	5,800	B.
August	75	31	49.4	3,040	B.
September	62	49	49.6	2,950	B.
October	75	49	53.2	3,270	C.
November	172	75	134	7,970	C.
The period				66,100	

NIOBRARA RIVER BASIN.

NIOBRARA RIVER NEAR LYNCH, NEBR.

Location.—At the highway bridge in sec. 2, T. 32 N., R. 10 W., 5 miles south of Lynch. Nearest tributary, Red Bird Creek, enters below.

Records available.—August 1 to December 31, 1913.

Drainage area.—Approximately 9,800 square miles.

Gage.—Vertical staff.

Control.—Shifting.

Discharge measurements.—Made from bridge.

Diversions.—Prior to September 1, 1912, there were approved diversions from Niobrara River of 306 second-feet for irrigation and 2,037 second-feet for power above the station, and 900 second-feet for power below. In Wyoming there are adjudicated diversions of 24 second-feet from the Niobrara and its tributaries.

Cooperation.—Station maintained in cooperation with the State engineer, who furnishes the field data.

Discharge measurements of Niobrara River near Lynch, Nebr., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
July 29	D. P. Weeks, jr	2.00	897	Nov. 16	D. P. Weeks, jr	2.15	1,410
Aug. 21	do	2.10	1,150	Dec. 13	W. M. Jefferys	2.10	(a)
Sept. 19	Weeks and Follansbee	2.31	1,330				

a River frozen.

Daily gage height, in feet, of Niobrara River near Lynch, Nebr., for 1913.

[N. E. Baker, observer.]

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.1	2.1	2.3	2.0	2.1	16	2.3	.....	2.2	.....	2.3
2	2.2	2.2	2.4	.....	2.4	17	2.0	.....	.....	2.3	2.2
3	2.2	2.2	2.3	2.1	2.3	18	2.2	.....	2.2	2.2	2.1
4	2.2	2.2	2.3	2.1	2.4	19	2.2	.....	2.0	2.1	2.5
5	2.3	2.2	.....	2.0	2.3	20	2.3	2.3	2.2	2.1	2.4
6	2.3	2.1	.....	1.9	2.3	21	2.2	2.3	2.2	2.2	2.4
7	2.3	2.1	.....	2.0	2.3	22	2.2	2.3	2.1	2.3	.....
8	2.2	2.2	.....	1.9	2.3	23	2.3	2.4	2.0	2.2	.....
9	2.6	2.2	.....	2.1	2.2	24	2.0	2.4	2.2	2.1	.....
10	2.6	2.4	.....	2.1	.....	25	2.2	2.5	.....	2.1	.....
11	2.5	2.3	.....	.....	2.3	26	2.1	2.4	2.2	2.3	.....
12	2.2	2.2	.....	2.3	2.1	27	2.1	2.4	1.9	2.2	.....
13	2.3	2.2	2.2	2.3	2.1	28	2.1	2.5	2.0	2.2	2.4
14	2.2	2.3	2.3	2.3	2.2	29	2.1	2.4	.....	2.3	2.3
15	2.2	2.2	2.3	2.4	2.3	30	2.0	2.3	.....	2.2	.....
						31	2.1	.....	2.0	.....	.....

NOTE.—Channel shifted to opposite side Sept. 27. Ice present during the great part of December.

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Daily discharge, in second-feet, of Niobrara River near Lynch, Nebr., for 1913.

Day.	Aug.	Sept.	Oct.	Nov.	Day.	Aug.	Sept.	Oct.	Nov.
1	970	1,150	1,370	1,200	16	1,330	1,240	1,370	1,410
2	1,050	1,240	1,480	1,250	17	1,050	1,270	1,370	1,580
3	1,050	1,240	1,370	1,300	18	1,240	1,300	1,370	1,470
4	1,050	1,240	1,370	1,300	19	1,240	1,330	1,180	1,360
5	1,140	1,240	1,360	1,200	20	1,330	1,330	1,370	1,360
6	1,140	1,150	1,360	1,170	21	1,240	1,330	1,370	1,470
7	1,140	1,150	1,350	1,260	22	1,240	1,330	1,270	1,580
8	1,050	1,240	1,350	1,170	23	1,330	1,480	1,180	1,470
9	1,550	1,240	1,340	1,360	24	1,000	1,480	1,370	1,360
10	1,670	1,440	1,340	1,360	25	1,240	1,600	1,370	1,360
11	1,550	1,330	1,330	1,470	26	1,150	1,480	1,370	1,580
12	1,240	1,240	1,330	1,580	27	1,150	1,480	1,120	1,470
13	1,330	1,240	1,320	1,580	28	1,150	1,600	1,200	1,470
14	1,240	1,330	1,430	1,580	29	1,150	1,480	1,200	1,580
15	1,240	1,240	1,430	1,710	30	1,050	1,370	1,200	1,470
					31	1,150	.....	1,200	.....

NOTE.—Discharge determined by shifting channel methods.

Monthly discharge of Niobrara River near Lynch, Nebr., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
August	1,670	970	1,210	74,400
September	1,600	1,150	1,330	79,100
October	1,480	1,120	1,320	81,200
November	1,710	1,170	1,420	84,500
The period	.....	.....	.....	319,000

NIOBRARA RIVER AT NIOBRARA, NEBR.

Location.—At Government highway bridge spanning main channel in the SE. ¼ sec. 18, T. 32 N., R. 56 W., half a mile from the depot at Niobrara. The station is 1½ miles above the mouth. No tributaries enter below.

Records available.—August 19, 1910, to July 26, 1913, when station was discontinued in favor of station near Lynch, Nebr. From May 11, 1902, to October 25, 1902, a station was maintained at a highway bridge 1 mile southwest of Niobrara.

Drainage area.—Not measured.

Gage.—Vertical staff.

Control.—Extremely shifting. Station is possibly within the influence of backwater from Missouri River.

Discharge measurements.—Made from bridge.

Winter flow.—Ice causes backwater for short periods.

Diversions.—Prior to September 1, 1912, there were approved diversions of 561 second-feet for irrigation and 2,755 second-feet for power from Niobrara River above the station. There are also approved diversions of 180 second-feet for irrigation and 453 second-feet for power from tributaries entering above. In Wyoming there are adjudicated diversions of 24 second-feet from the Niobrara and tributaries.

Accuracy.—Owing to the shifting channel and the fact that no discharge measurements were made during 1913, no estimates of discharge have been made.

Cooperation.—Field data furnished by State engineer.

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Daily gage height, in feet, of Niobrara River at Niobrara, Nebr., for 1913.

[A. T. Reid, observer.]

Day.	Apr.	May.	June.	July.	Day.	Apr.	May.	June.	July.
1	1.9	1.7	1.8	1.8	16	1.8	1.7	1.8	2.0
2	1.8	2.0	1.8	1.8	17	1.7	1.7	1.9	2.0
3	1.7	2.1	1.9	1.8	18	1.7	1.7	1.9	2.1
4	1.8	2.0	1.8	1.8	19	1.7	1.8	1.9	2.0
5	1.8	1.9	1.8	1.8	20	1.8	2.1	1.8	2.0
6	1.6	1.8	1.8	1.8	21	1.7	2.0	1.9	2.1
7	1.8	1.8	1.7	1.8	22	1.7	1.9	2.0	2.0
8	1.7	1.9	1.8	1.9	23	2.0	1.9	2.0	2.0
9	1.8	2.0	1.8	1.9	24	2.1	1.8	1.9	2.1
10	1.8	1.9	1.8	1.9	25	1.9	1.8	1.8	2.1
11	1.7	1.8	1.9	2.2	26	1.8	1.8	1.8	2.0
12	1.9	1.9	1.8	2.1	27	1.7	1.7	1.9	.....
13	2.2	3.0	1.8	2.6	28	1.6	1.7	2.0	.....
14	2.0	2.1	1.8	1.9	29	1.7	1.8	1.9	.....
15	1.9	1.6	1.8	2.0	30	1.7	1.7	1.8	.....
					31	.....	1.8	.....	.....

BIG SIOUX RIVER BASIN.

ROCK RIVER AT LUVERNE, MINN.

Location.—At Chicago, Rock Island & Pacific Railway bridge at Luverne, 3½ mile above mouth of Elk Creek.

Records available.—August 23, 1911, to December 31, 1913.

Drainage area.—440 square miles.

Gage.—Vertical staff gage.

Control.—Shifting at high stages; probably permanent at low stages.

Winter flow.—Affected by ice; observations discontinued.

Regulation.—Low rock dam above gage does not regulate the flow, but raises water level about 2 feet; discharge relation not affected thereby.

Accuracy.—Owing to the liability to shift, the records can not be considered better than fair.

Discharge measurements of Rock River at Luverne, Minn., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 23	S. B. Soulé	4.07	342
Sept. 27	B. J. Peterson	1.51	9.2
27	....do	1.51	9.1

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Daily gage height, in feet, of Rock River at Luverne, Minn., for 1913.

[C. W. Pinkerton, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.0	2.2	2.45	2.6	2.55	1.95	1.5	1.55	1.65
2	2.0	2.2	2.4	2.35	2.3	1.9	1.5	1.5	1.6
3	1.95	2.15	2.35	2.2	2.1	1.95	1.5	1.5	1.6
4	1.9	2.15	2.25	2.15	1.95	1.85	1.5	1.6	1.6
5	1.8	2.1	2.15	2.1	1.85	1.8	1.5	1.6	1.6
6	1.85	2.05	2.1	2.0	1.8	1.8	1.5	1.6	1.6
7	1.85	2.05	2.05	1.95	1.7	1.8	1.5	1.6	1.6
8	1.8	2.1	1.9	1.9	1.7	1.7	1.55	1.65	1.6
9	1.8	2.1	1.9	1.8	1.7	1.7	1.6	1.6	1.6
10	1.8	2.1	1.9	1.8	1.65	1.7	1.65	1.6	1.6
11	1.75	2.0	1.9	1.85	1.7	1.65	1.7	1.6	1.6
12	1.8	2.0	1.85	1.85	1.7	1.6	1.7	1.6	1.6
13	1.8	2.1	1.8	1.8	1.65	1.6	1.7	1.6	1.6
14	2.4	2.2	1.8	1.9	1.6	1.55	1.7	1.6	1.55
15	2.9	2.3	1.8	1.9	1.6	1.5	1.7	1.6	1.5
16	4.2	2.45	1.8	1.85	1.6	1.5	1.65	1.6	1.5
17	4.2	2.5	1.75	1.8	1.55	1.5	1.65	1.6	1.5
18	4.3	2.45	1.7	1.8	1.55	1.5	1.6	1.6	1.5
19	3.7	2.4	1.7	1.7	1.55	1.5	1.6	1.6	1.5
20	3.1	2.8	1.8	1.7	2.2	1.5	1.6	1.6	1.5
21	2.55	3.0	1.75	1.7	1.75	1.5	1.6	1.6	.....
22	2.25	4.3	1.8	1.65	2.3	1.5	1.6	1.6	.....
23	2.4	4.0	1.9	1.6	3.2	1.5	1.6	1.65	.....
24	2.9	3.5	1.85	1.6	3.8	1.55	1.6	1.7	.....
25	3.5	2.9	1.8	1.65	3.3	1.55	1.55	1.7	.....
26	3.65	2.9	1.8	1.65	2.9	1.55	1.55	1.7	.....
27	3.2	2.9	2.0	1.6	2.65	1.5	1.55	1.7	.....
28	2.85	3.0	3.4	1.6	2.45	1.5	1.55	1.7	.....
29	2.5	3.1	4.1	1.6	2.25	1.6	1.6	1.65	.....
30	2.3	2.8	3.25	1.7	2.1	1.5	1.6	1.65	.....
31	.....	2.55	.....	2.2	2.05	.....	1.55	.....	.....

Daily discharge, in second-feet, of Rock River at Luverne, Minn., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	32	49	74	92	86	28	8	9	12
2	32	49	69	64	59	25	8	8	10
3	28	44	64	49	40	28	8	8	10
4	25	44	54	44	28	22	8	10	10
5	19	40	44	40	22	19	8	10	10
6	22	36	40	32	19	19	8	10	10
7	22	36	36	28	14	19	8	10	10
8	19	40	25	25	14	14	9	12	10
9	19	40	25	19	14	14	10	10	10
10	19	40	25	19	12	14	12	10	10
11	16	32	25	22	14	12	14	10	10
17	19	32	22	22	14	10	14	10	10
13	19	40	19	19	12	10	14	10	10
14	69	49	19	25	10	9	14	10	9
15	134	59	19	25	10	8	14	10	8
16	394	74	19	22	10	8	12	10	8
17	394	80	16	19	9	8	12	10	8
18	416	74	14	19	9	8	10	10	8
19	285	69	14	14	9	8	10	10	8
20	167	118	19	14	49	8	10	10	8
21	86	150	16	14	16	8	10	10	8
22	54	416	19	12	59	8	10	10	8
23	69	350	25	10	185	8	10	12	7
24	134	245	22	10	306	9	10	14	7
25	245	134	19	12	205	9	9	14	7
26	275	134	19	12	134	9	9	14	7
27	185	134	32	10	98	8	9	14	7
28	126	150	225	10	74	8	9	14	6
29	80	167	372	10	54	10	10	12	6
30	59	118	195	14	40	8	10	12	6
31	.....	86	.....	49	36	.....	9	.....	6

NOTE.—Discharge determined from a fairly well-defined curve. Discharge Dec. 21–31 estimated.

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Monthly discharge of Rock River at Luverne, Minn., for 1913.

[Drainage area, 440 square miles.]

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
April	416	16	115	0.261	0.29	6,840	B.
May	416	32	101	.230	.27	6,210	B.
June	372	14	52.9	.120	.13	3,150	B.
July	92	10	25.0	.057	.07	1,540	B.
August	306	9	53.6	.122	.14	3,300	B.
September	28	8	12.5	.028	.03	744	B.
October	14	8	10.2	.023	.03	627	B.
November	14	8	10.8	.025	.03	643	B.
December	12	6	8.5	.019	.02	523	B.
The period						23,600	

PLATTE RIVER BASIN.

NORTH PLATTE RIVER ABOVE PATHFINDER RESERVOIR, WYO.

Location.—About 25 miles above Pathfinder dam, in sec. 27, T. 26 N., R. 84 W., three-fourths mile below mouth of Black Canyon, and 900 feet below mouth of Lost Creek, the nearest tributary. Backwater from Pathfinder reservoir reaches within 2½ miles of station.

Records available.—October 7 to December 4, 1913.

Drainage area.—Approximately 8,700 square miles (measured from Land Office map).

Gage.—Friez automatic gage.

Control.—Should be permanent, as station is at the lower end of a pool 600 feet long and just above rapids.

Discharge measurements.—Made from car and cable.

Winter flow.—Ice causes backwater and records are discontinued.

Diversions.—Prior to July 1, 1912, there were adjudicated diversions of 58 second-feet from the North Platte between Saratoga and the station above Pathfinder, and diversions of 1,270 second-feet from intervening tributaries.

Accuracy.—Conditions are excellent, and the base data, which are all that are available, are reliable.

Cooperation.—Station maintained in cooperation with the United States Reclamation Service.

The following discharge measurement was made by R. H. Fletcher:

October 12.—Gage height, 1.17 feet; discharge, 505 second-feet.

Daily gage height, in feet, of North Platte River above Pathfinder reservoir, Wyo., for 1913.

[H. J. Slack, observer.]

Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.	Day.	Oct.	Nov.	Dec.
1	.....	1.15	0.95	11	1.21	1.27	.....	21	1.13	1.27	.....
2	.....	1.25	.79	12	1.19	1.24	.....	22	1.15	1.24	.....
3	.....	1.33	.92	13	1.17	1.24	.....	23	1.16	1.17	.....
4	.....	1.30	.80	14	1.15	1.27	.....	24	1.19	1.03	.....
5	.....	1.30	.....	15	1.16	1.30	.....	25	1.20	1.01	.....
6	.....	.....	.....	16	1.25	1.31	.....	26	.....	.99	.....
7	1.42	.....	.....	17	1.26	1.29	.....	27	.....	1.10	.....
8	1.33	1.30	.....	18	1.20	1.25	.....	28	.....	1.37	.....
9	1.30	1.30	.....	19	1.17	1.20	.....	29	.....	1.18	.....
10	1.24	1.27	.....	20	1.18	1.24	.....	30	.....	1.05	.....

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NORTH PLATTE RIVER AT PATHFINDER, WYO.

Location.—One-third mile south of Pathfinder, one-fourth mile below Pathfinder dam, and 800 feet below the mouth of the canyon, in sec. 24, T. 29 N., R. 84 W. The nearest tributary, Canyon Creek, enters 2 miles above.

Records available.—May 9, 1905, to December 31, 1913.

Drainage area.—12,000 square miles (measured from Land Office map).

Gage.—Chain gage.

Control.—Permanent.

Discharge measurements.—Made from car and cable.

Winter flow.—Ice causes slight backwater for short periods.

Regulation.—The Pathfinder dam forms a reservoir of 1,025,000 acre-feet capacity. This reservoir materially changes the natural run-off of the river, as is seen by a comparison with records of inflow. These latter are based on evaporation losses, change of stage in the reservoir, and the outflow.

Diversions.—Prior to July 1, 1912, there were adjudicated diversions of 279 second-feet from tributaries entering the North Platte between the station above Pathfinder and this station. Near Whalen, 150 miles below, the water from the Pathfinder reservoir is diverted by the Interstate canal and used to irrigate land in Nebraska and Wyoming.

Cooperation.—Records furnished by United States Reclamation Service.

Discharge measurements of North Platte River at Pathfinder, Wyo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 22	H. D. Comstock	3.13	1,320
31	do	4.70	2,700
June 10	do	5.01	3,530
26	do	4.73	3,070

Daily gage height, in feet, of North Platte River at Pathfinder, Wyo., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.4	−0.6	−0.6	3.9	4.85	4.8	4.65	4.15	2.3	−0.6	− 0.6
2	.....	− .4	− .6	− .6	3.8	5.25	4.8	4.65	4.15	2.3	− .6	− .6
3	.....	1.4	− .6	.6	3.8	5.25	4.8	4.65	4.15	2.3	− .6	− .6
4	.....	1.35	− .6	− .6	3.85	5.25	4.8	4.65	4.05	2.3	− .6	− .6
5	.....	1.4	− .6	− .6	4.5	5.25	4.8	4.6	4.05	2.3	− .6	− .6
6	.....	1.4	− .6	− .6	4.5	5.0	4.8	4.6	4.05	2.3	− .6	− .6
7	.....	1.4	− .6	− .6	4.4	5.0	4.8	4.6	4.1	2.3	− .6	− .6
8	.....	1.25	− .6	− .6	4.4	5.0	5.3	4.65	4.1	2.3	− .6	− .6
9	.....	− .4	− .6	− .6	4.4	5.0	4.7	4.6	4.05	2.3	− .6	− .6
10	.....	− .4	− .6	− .6	4.4	5.05	4.5	4.7	4.05	2.3	− .6	− .6
11	.....	− .4	− .6	− .6	4.3	5.0	4.45	4.7	4.6	2.3	− .6	− .6
12	1.35	− .4	− .6	2.45	4.25	5.05	4.45	4.7	4.6	2.3	− .6	− .6
13	1.35	− .4	− .6	− .6	4.0	5.0	4.4	4.7	4.6	−0.6	− .6	− .6
14	1.35	− .4	− .6	− .6	4.05	5.05	4.4	4.7	4.6	− .6	− .6	− .6
15	1.35	− .4	− .6	− .6	4.3	5.05	4.45	4.65	4.6	− .6	− .6	− .6
16	1.35	− .6	− .6	− .6	3.85	5.05	4.6	4.65	4.55	− .6	− .6	− .6
17	1.35	− .6	− .6	− .6	2.8	5.0	4.8	4.65	4.75	− .6	− .6	− .6
18	1.35	− .6	− .6	− .6	2.8	5.05	4.75	4.65	4.75	− .6	− .6	− .6
19	1.35	− .6	− .6	− .6	2.85	5.0	4.7	4.65	4.7	− .6	− .6	− .6
20	1.35	− .6	− .6	− .6	2.6	5.05	4.65	4.65	4.7	− .6	− .6	− .6
21	1.35	− .6	− .6	− .6	2.6	4.85	4.65	4.7	4.0	− .6	− .6	− .6
22	1.35	− .6	− .6	− .6	2.65	4.85	4.65	4.1	3.95	− .6	− .6	− .6
23	1.35	− .6	− .6	− .6	3.7	4.8	4.65	4.1	3.95	− .6	− .6	− .6
24	1.35	− .6	− .6	− .6	3.7	4.85	4.65	4.1	3.95	− .6	− .6	− .6
25	1.35	− .6	− .6	− .6	3.7	4.85	4.65	4.1	2.95	− .6	− .6	− .6
26	1.4	− .6	− .6	− .6	3.75	4.8	4.65	4.1	2.95	− .6	− .6	− .6
27	1.5	− .6	− .6	− .6	3.7	4.85	4.7	4.05	2.35	− .6	− .6	− .6
28	1.45	− .6	.....	− .6	3.7	4.8	4.7	4.4	2.3	− .6	− .6	− .6
29	1.45	.....	.....	− .6	3.75	4.8	4.7	4.35	2.3	− .6	− .6	− .6
30	1.4	.....	− .6	3.9	4.7	4.85	4.65	4.15	2.3	− .6	− .6	− .6
31	1.4	.....	− .6	.....	4.65	.....	4.7	4.15	.....	− .6	.....	− .6

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Daily discharge, in second-feet, of North Platte River at Pathfinder, Wyo., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	354	340	3	3	2,140	3,170	3,200	3,040	2,420	760	4	5
2	354	20	3	3	2,000	3,780	3,200	3,000	2,480	760	4	5
3	396	320	3	3	2,030	3,820	3,200	3,000	2,420	760	4	5
4	396	310	3	3	1,900	3,740	3,200	3,000	2,320	760	4	5
5	375	310	3	3	2,090	3,820	3,200	2,970	2,300	760	4	5
6	375	320	3	4	2,800	3,340	3,200	2,940	2,300	760	5	5
7	375	320	3	4	2,220	3,470	3,200	2,940	2,370	760	5	5
8	365	270	3	4	2,700	3,300	3,520	2,980	2,360	760	5	5
9	355	15	3	4	2,700	3,470	3,400	2,970	2,330	760	5	5
10	355	2	3	4	2,700	3,500	2,840	3,060	2,300	760	5	5
11	345	2	3	4	2,300	3,500	2,760	3,070	2,810	760	5	5
12	313	2	3	770	2,550	3,500	2,760	3,070	2,990	760	5	5
13	313	2	3	210	2,390	3,500	2,720	3,070	2,940	194	5	5
14	313	2	3	5	2,430	3,500	2,700	3,070	2,950	4	5	5
15	313	2	3	5	2,570	3,240	2,730	3,020	2,940	4	5	5
16	313	2	3	20	1,960	3,540	2,850	3,000	2,910	4	5	5
17	313	2	3	20	1,180	3,500	3,170	3,000	3,120	4	5	5
18	313	2	3	5	1,100	3,500	3,170	3,000	3,140	4	5	5
19	313	2	3	20	1,120	3,500	3,080	3,000	3,100	4	5	5
20	313	2	3	5	950	3,500	3,020	3,000	3,070	4	5	5
21	313	2	3	5	950	2,860	3,000	3,060	2,280	4	5	5
22	310	2	3	20	970	3,260	3,000	2,450	2,220	4	5	5
23	310	2	3	5	1,630	3,230	3,000	2,360	2,200	4	5	5
24	310	2	3	5	1,920	3,230	3,000	2,340	2,200	4	5	5
25	310	2	3	10	1,920	3,260	3,000	2,360	1,280	4	5	5
26	320	2	3	5	1,950	3,230	3,000	2,360	1,220	4	5	5
27	350	2	3	5	1,950	3,230	3,030	2,340	900	4	5	5
28	360	2	3	5	1,920	3,230	3,050	2,650	775	4	5	5
29	360	.....	3	10	1,950	3,200	3,050	2,670	760	4	5	5
30	350	.....	3	1,810	2,890	3,230	3,030	2,440	760	4	5	5
31	340	.....	3	.....	3,040	.....	3,040	2,420	.....	4	.....	5

Monthly discharge of North Platte River at Pathfinder, Wyo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
January	396	310	339	20,800
February	340	2	80.8	4,490
March	3	3	3.0	184
April	1,810	3	99.3	5,910
May	3,040	950	2,050	126,000
June	3,820	2,860	3,400	202,000
July	3,520	2,700	3,040	187,000
August	3,070	2,340	2,830	174,000
September	3,140	760	2,270	135,000
October	760	4	303	18,600
November	5	4	4.8	286
December	5	5	5.0	307
The year	3,820	2	1,210	875,000

NOTE.—Table shows outflow from Pathfinder reservoir.

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Daily inflow, in second-feet, to Pathfinder reservoir at Pathfinder, Wyo., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	410	390	410	2,810	4,580	8,010	1,810	960	170	780	690	390
2	390	560	430	7,530	4,860	8,020	1,740	800	270	790	700	390
3	320	400	440	7,970	4,980	8,750	1,390	980	170	650	700	390
4	340	350	550	7,590	4,980	8,050	800	920	190	630	700	390
5	350	420	550	6,670	3,750	7,560	1,240	710	360	430	700	580
6	340	410	460	5,420	3,900	6,300	1,080	560	260	610	700	390
7	320	340	570	5,370	4,380	5,700	950	820	290	610	710	390
8	330	370	580	6,850	4,310	4,750	780	550	370	610	710	390
9	320	430	610	7,230	4,810	4,140	800	890	330	810	710	200
10	320	430	620	6,430	4,830	5,110	980	340	370	800	710	390
11	310	450	740	4,070	5,000	4,420	470	700	450	660	720	390
12	280	430	660	3,350	5,320	4,650	770	700	520	680	730	200
13	300	460	670	2,810	6,200	4,750	630	460	420	710	730	200
14	280	410	810	2,680	6,190	4,520	380	630	430	730	550	200
15	290	460	960	4,420	6,440	4,290	680	400	370	660	550	200
16	280	460	990	6,110	5,380	3,950	520	450	600	630	730	200
17	300	500	900	6,620	5,230	3,400	650	720	890	480	740	200
18	280	520	960	7,590	5,110	3,110	370	450	730	640	740	390
19	330	530	980	6,630	4,650	2,890	1,020	450	410	640	740	390
20	330	480	850	6,880	4,490	2,950	830	460	330	640	740	390
21	340	430	1,010	6,720	5,060	2,500	1,000	250	270	650	740	390
22	340	400	880	6,010	4,570	2,710	1,070	440	310	490	740	390
23	340	460	910	6,190	4,180	2,720	940	350	270	660	560	200
24	340	470	760	5,400	4,490	2,120	1,060	500	280	660	560	200
25	340	500	760	4,550	4,470	2,280	1,650	320	330	660	560	200
26	350	450	630	4,160	4,620	1,730	2,340	470	420	670	560	200
27	370	460	630	2,880	5,240	2,650	1,630	360	580	340	570	400
28	360	490	640	2,460	5,750	2,370	1,370	220	460	680	570	400
29	360	.....	810	2,940	8,020	2,310	1,210	190	470	680	570	400
30	400	.....	1,150	3,410	7,450	1,730	1,060	350	510	340	570	200
31	380	.....	1,860	.....	8,440	.....	730	310	.....	680	.....	400

NOTE.—Daily inflow computed from records of outflow, evaporation losses, and change in stage of water in reservoir.

Monthly inflow to Pathfinder reservoir at Pathfinder, Wyo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
January	410	280	334	20,500
February	560	340	445	24,700
March	1,860	410	767	47,200
April	7,970	2,460	5,320	317,000
May	8,440	3,750	5,220	321,000
June	8,750	1,730	4,280	255,000
July	2,340	370	1,030	63,300
August	980	190	539	33,100
September	890	170	394	23,400
October	810	340	635	39,000
November	740	550	667	39,700
December	580	200	324	19,900
The year	8,750	170	1,660	1,200,000

NORTH PLATTE RIVER AND INTERSTATE CANAL AT WHALEN, WYO.

Location.—At head of the Interstate canal at Whalen, in sec. 11, T. 26 N., R. 65 W. Nearest important tributary is Cottonwood Canyon Creek, an intermittent stream which enters 1½ miles below.

Records available.—May 1, 1909, to December 31, 1913. These records represent the discharge passing the overfall weir at Whalen and also amount of water passing the headgates of the canal, which are located just above Whalen weir.

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Drainage area.—Not measured.

Gage.—To determine the flow over the weir a vertical staff is used, its zero being at the weir crest. The discharge is then computed by a weir formula. There are also four sluice gates in the dam, through which the discharge is computed. In the river, 75 feet downstream from the crest gage, is a second gage, with zero 10 feet below that of the weir gage. The second gage is only used in computing the discharge through the gates when the openings are submerged. The discharge through the headgates of the canal is computed from the nine gate openings. A vertical staff located in the canal, 1,000 feet below the headgates, is used in computing the discharge when the headgate openings are submerged.

Discharge measurements.—In order to check the coefficients used in the discharge computations, a car and cable have been erected 1 mile downstream.

Regulation.—The discharge represents chiefly the effect of the Pathfinder reservoir which stores water for use in the Interstate canal.

Diversions.—Prior to July 1, 1912, there were adjudicated diversions from North Platte River of 319 second-feet between the Pathfinder reservoir and the Wyoming-Nebraska line, exclusive of the diversion by United States Reclamation Service. It is not known what percentage of these diversions is above the stations.

Cooperation.—Records furnished by United States Reclamation Service.

Daily discharge, in second-feet, of North Platte River and Interstate canal at Whalen, Wyo., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	770	525	410	1,070	1,540	2,340	2,910	2,810	3,050	1,080	294	215
2	759	500	400	1,680	1,380	2,790	2,940	2,810	2,360	984	300	175
3	705	460	400	1,950	1,290	3,580	2,940	2,810	2,220	984	308	180
4	863	425	430	2,010	2,630	3,600	2,940	2,810	2,360	1,080	306	190
5	640	425	420	1,730	2,640	3,600	2,900	2,820	2,180	1,050	294	225
6	565	400	400	1,520	2,550	3,550	2,920	2,990	2,190	1,050	294	175
7	360	370	500	1,280	2,680	3,720	2,930	2,860	2,120	1,050	295	175
8	390	370	500	1,220	3,050	3,270	2,970	2,840	2,120	926	290	215
9	410	370	525	1,240	2,690	3,480	2,910	2,690	2,360	926	285	175
10	490	390	575	1,230	2,950	3,340	3,050	2,650	2,130	867	280	180
11	446	375	575	1,120	3,160	3,470	3,290	2,700	2,130	869	280	190
12	495	425	600	1,030	2,320	3,330	2,790	2,850	1,720	869	275	275
13	495	495	625	962	2,880	3,610	2,630	2,840	1,670	818	260	225
14	332	570	625	943	2,900	3,450	2,500	2,810	2,580	818	260	185
15	500	520	650	991	3,020	3,710	2,400	2,810	2,570	818	255	195
16	650	405	650	1,280	2,770	3,500	2,410	2,810	3,150	818	255	210
17	700	405	700	2,260	2,920	3,270	2,320	2,810	3,160	656	255	195
18	750	420	700	2,180	2,700	3 170	3,260	2,830	2,860	555	255	205
19	750	425	750	2,130	2,210	2,870	3,340	2,920	2,860	458	245	205
20	750	520	750	2,290	1,680	2,870	3,340	2,830	2,930	433	240	195
21	750	413	700	2,120	1,570	2,970	3,500	2,830	2,990	425	235	205
22	750	545	680	2,060	1,530	3,380	3,060	2,830	2,750	399	235	215
23	725	500	600	1,980	1,460	2,960	3,030	2,830	2,750	382	235	225
24	700	500	400	1,780	1,300	3,000	2,870	2,520	2,320	369	235	225
25	700	500	375	1,600	1,300	3,100	2,950	2,200	2,320	364	170	245
26	700	430	400	1,350	1,550	3,200	2,860	2,100	2,240	352	165	238
27	775	370	400	1,330	1,830	3,200	2,930	2,120	2,110	329	170	238
28	700	430	350	1,220	1,870	3,220	3,550	2,120	1,510	329	255	255
29	700	.....	350	1,070	1,780	3,130	3,150	2,120	1,400	306	225	235
30	675	.....	400	1,120	1,980	3,080	2,980	2,200	1,340	301	210	196
31	600	.....	900	.....	2,030	.....	2,810	2,360	.....	301	.....	190

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Monthly discharge of North Platte River and Interstate canal at Whalen, Wyo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
January	863	332	632	38,900
February	570	370	446	24,800
March	900	350	540	33,200
April	2,290	943	1,520	90,400
May	3,230	1,290	2,230	137,000
June	3,720	2,340	3,270	195,000
July	3,550	2,320	2,950	181,000
August	2,990	2,100	2,660	164,000
September	3,160	1,340	2,350	140,000
October	1,080	301	676	41,600
November	308	165	255	15,200
December	275	175	208	12,800
The year	3,720	165	1,480	1,070,000

Daily discharge, in second-feet, of Interstate canal at Whalen, Wyo., for 1913.

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	.....	410	.....	645	1,008	1,051	1,303	1,200
2	.....	400	.....	700	1,060	1,078	1,310	1,200
3	.....	400	.....	700	1,150	1,078	1,303	1,200
4	.....	430	.....	709	1,195	1,078	1,303	1,200
5	.....	420	.....	757	1,200	1,130	1,303	1,200
6	.....	400	.....	846	1,112	1,194	1,305	1,200
7	.....	375	.....	882	1,265	1,246	1,318	1,200
8	.....	.....	.....	891	1,270	1,288	1,338	1,200
9	.....	.....	.....	901	1,245	1,318	1,338	1,200
10	.....	.....	.....	887	1,245	1,281	1,338	1,200
11	.....	.....	.....	711	1,220	1,296	1,252	1,235
12	225	.....	.....	679	1,142	1,335	940	1,227
13	485	.....	.....	436	1,155	1,321	946	1,240
14	570	.....	.....	309	1,207	1,345	940	1,155
15	520	.....	.....	312	1,207	1,345	940	870
16	405	.....	.....	320	1,047	1,360	940	645
17	405	.....	465	369	1,161	726	963	786
18	420	.....	518	381	1,219	105	963	786
19	425	.....	517	358	1,185	0	963	800
20	520	.....	517	391	1,136	0	963	670
21	413	.....	517	257	1,136	281	963	580
22	545	.....	.....	242	1,136	606	963	580
23	500	.....	.....	242	1,143	786	963	580
24	500	.....	.....	263	1,092	820	1,017	580
25	500	.....	.....	368	956	902	1,055	580
26	430	.....	.....	491	951	1,144	1,090	580
27	370	.....	.....	563	951	1,150	1,135	580
28	430	.....	.....	781	976	1,260	1,130	580
29	.....	.....	387	904	1,026	1,282	1,130	580
30	.....	.....	440	960	1,026	1,290	1,130	284
31	.....	.....	.....	902	.....	1,303	1,180	.....

NOTE.—No flow on days for which no discharge is given. Prior to Mar. 8 flow was not used for irrigation, but was merely carried to Sand Point wasteway.

Monthly discharge of Interstate Canal at Whalen, Wyo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
February 12–28	570	225	451	15,200
May	960	242	586	36,000
June	1,270	951	1,130	67,200
July	1,360	0	1,010	62,100
August	1,338	940	1,120	68,900
September	1,240	284	897	53,400

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NORTH PLATTE RIVER AT HENRY, NEBR.

Location.—At Henry post office, on the west line of sec. 3, T. 23 N., R. 58 W., within half a mile of Nebraska-Wyoming line.

Records available.—May 11, 1912, to November 13, 1913.

Drainage area.—Not measured.

Gage.—Three vertical staffs, one in each of the three separate channels. The datum of first two gages is the same; that for the gage in third channel is 1 foot lower to avoid negative readings.

Control.—Shifting.

Discharge measurements.—Made from bridge.

Winter flow.—No data; observations discontinued.

Diversions.—Prior to September 1, 1912, there was an approved diversion of 220 second-feet from the North Platte between the Wyoming-Nebraska State line and this station.

Accuracy.—Channel shifts daily and the estimates with a few exceptions represent discharge measurements.

Cooperation.—Data as published furnished by the State engineer.

Daily discharge, in second-feet, of North Platte River at Henry, Nebr., for 1913.

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Day.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	2,450	1,750	954	1,410	517	16	2,680	1,040	1,860	1,540	1,230	.....
2	.....	1,850	1,370	2,080	1,320	a516	17	2,640	1,070	1,930	2,830	1,190	.....
3	.....	1,840	1,550	2,130	1,020	516	18	a2,470	3,360	1,970	2,540	1,150	.....
4	2,470	a1,900	1,530	1,230	1,340	559	19	a2,310	4,140	1,890	2,150	a1,130	.....
5	2,110	1,750	1,620	1,240	a1,380	511	20	2,140	3,370	1,930	2,350	1,110	.....
6	a2,090	1,850	1,390	1,270	1,430	544	21	2,150	3,420	2,080	2,380	706	.....
7	a2,070	1,670	1,670	1,330	1,480	560	22	2,190	2,900	1,890	2,600	a719	.....
8	a2,060	1,800	1,720	1,150	1,490	508	23	2,350	2,310	1,770	2,620	732	.....
9	a2,050	1,750	1,680	1,180	1,580	a488	24	1,950	2,270	1,710	2,620	718	.....
10	2,030	1,550	1,650	1,070	1,410	468	25	2,130	2,300	1,760	2,460	727	.....
11	2,000	1,630	1,660	1,190	1,460	540	26	2,340	2,180	1,270	2,170	a735	.....
12	2,060	a1,490	1,680	a1,160	a1,300	532	27	2,330	1,950	1,080	2,190	743	.....
13	2,120	1,350	2,110	1,120	1,150	496	28	2,560	2,140	1,100	a2,000	730	.....
14	2,500	1,270	1,890	1,150	1,170	.....	29	2,200	2,360	1,110	1,800	707	.....
15	2,440	1,180	1,800	1,530	1,240	.....	30	2,080	2,060	986	1,290	681	.....
							31	.....	2,060	1,030	.....	599	.....

a Interpolated.

NOTE.—Daily discharges given are actual discharge measurements, with the exception of a few days when discharge was interpolated.

Monthly discharge of North Platte River at Henry, Nebr., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
June 4–30	2,680	1,950	2,240	120,000
July	4,140	1,040	2,070	127,000
August	2,110	986	1,630	100,000
September	2,830	954	1,780	106,000
October	1,580	599	1,090	67,000
November 1–13	560	468	520	13,000
The period	.....	.....	.....	533,000

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NORTH PLATTE RIVER NEAR MITCHELL, NEBR.

Location.—At highway bridge 1 mile south of Mitchell, on line between secs. 27 and 28, T. 23 N., R. 56 W. The nearest tributary is Spottedtail Creek, an intermittent stream that enters just below the station.

Records available.—June 3, 1901, to June 30, 1913. From May 29, 1897, to October 31, 1900, a station was maintained near Gehring. Though no tributaries enter between the two points, the records are not directly comparable during the irrigation season, as water is diverted for irrigation.

Drainage area.—24,400 square miles.

Gage.—Chain-gage datum lowered 1.00 foot on May 3, 1902, to avoid negative readings.

Control.—Shifting since 1911.

Discharge measurements.—Made from bridge.

Winter flow.—River frozen over; observations discontinued.

Regulation.—The Pathfinder reservoir of United States Reclamation Service controls the flow at this station to a certain extent.

Diversions.—Prior to September 1, 1912, there were approved diversions of 1,968 second-feet from North Platte River between this station and Henry, and diversions to 75 second-feet from intervening tributaries.

Accuracy.—No discharge measurements made during 1912; one measurement made in 1913 showed old rating curve no longer applicable; estimates of discharge not prepared.

Cooperation.—The field data furnished by State engineer.

The following discharge measurement was made by Boden and Cass:
April 8, 1913.—Gage height, 2.95 feet; discharge, 2,850 second-feet.

Daily gage height, in feet, of North Platte River near Mitchell, Nebr., for 1913.

[B. H. Newbold, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Day.	Mar.	Apr.	May.	June.	July.
1	.....	3.2	2.4	.....	2.4	16	.....	2.6	2.4	2.3	.....
2	.....	3.3	2.3	2.2	2.4	17	3.3	2.7	2.4	2.3	.....
3	.....	3.4	2.3	2.2	2.4	18	3.4	2.8	.....	2.3	.....
4	.....	3.6	.....	2.4	2.4	19	3.4	2.8	2.3	2.3	.....
5	.....	3.1	2.5	2.6	2.0	20	3.3	.....	2.3	2.3	.....
6	.....	.....	2.6	2.5	.....	21	3.3	2.7	2.3	2.3	.....
7	.....	3.0	2.5	2.4	2.3	22	3.3	2.7	2.4	.....	.....
8	.....	3.0	2.4	.....	2.1	23	.....	2.7	2.5	2.3	.....
9	.....	3.0	2.4	2.4	2.1	24	3.6	2.7	2.5	2.4	.....
10	3.2	3.1	2.4	2.3	2.1	25	3.4	2.7	.....	2.4	.....
11	3.2	3.0	2.4	2.3	.....	26	3.4	2.6	2.3	2.4	.....
12	3.2	3.0	2.4	2.3	.....	27	3.4	.....	2.3	2.4	.....
13	3.3	.....	2.7	2.3	.....	28	3.3	2.6	2.3	2.4	.....
14	3.3	2.8	2.6	2.3	.....	29	3.3	2.4	2.2	.....	.....
15	3.3	2.6	2.6	.....	.....	30	.....	2.4	2.2	2.4	.....
						31	3.2	.....	2.2	.....	.....

NORTH PLATTE RIVER AT NORTH PLATTE, NEBR.

Location.—At highway bridge half a mile north of North Platte, in sec. 28, T. 14 N., R. 30 W., 1 mile below mouth of Scout Creek and 4½ miles above junction with the South Platte.

Records available.—February 25, 1895, to September 30, 1913.

Drainage area.—28,500 square miles.

Gage.—A staff gage installed October 15, 1910. From October 5, 1894, to May 31, 1910, the gage was a vertical staff at the railroad bridge, 2 miles east of North Platte. On March 25, 1910, the station was moved 2 miles upstream to its present site, and a chain gage reading to a different datum was installed. This gage was stolen July 1, 1910, and records interrupted until October 15, 1910, when present gage, reading to a different datum, was placed in position.

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Control.—Shifting.

Discharge measurements.—Made from highway bridge.

Winter flow.—The river frequently freezes to the bottom during winter, as it is very shallow.

Diversions.—Prior to September 1, 1912, there were approved diversions of 3,626 second-feet from the North Platte between this station and Mitchell and diversions of 927 second-feet from intervening tributaries.

Accuracy.—Estimates obtained by indirect method for shifting channels, and can be considered only approximate.

Cooperation.—Field data furnished by the State engineer.

Discharge measurements of North Platte River at North Platte, Nebr., in 1913.

[Hydrographer, C. J. McNamara.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Mar. 31	3.80	5,040	June 29	2.80	982	Sept. 28	3.60	3,070
Apr. 15	3.70	4,610	July 14	2.40	300	Oct. 18	3.30	1,980
Apr. 30	3.70	3,910	Aug. 2	2.80	1,240	Nov. 2	3.00	1,230
May 16	3.90	4,390	Aug. 17	2.50	526	Nov. 16	3.20	1,630
June 1	2.90	1,350	Aug. 31	2.40	350	Sept. 30	3.20	1,730
June 15	3.30	2,130	Sept. 14	2.70	682	Dec. 15	2.80	988

Daily gage height, in feet, of North Platte River at North Platte, Nebr., for 1913.

[Hendy and Ogier, observers.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	3.45	2.85	2.70	3.00	2.35	3.5	3.1	3.25
2	.....	3.40	2.75	2.60	2.95	2.40	3.45	3.1	3.2
3	.....	3.40	2.8	2.80	2.90	2.40	3.45	3.1	3.35
4	.....	3.35	2.70	2.70	2.90	2.40	3.4	3.1	3.45
5	.....	3.30	2.60	2.60	2.90	2.50	3.3	3.1	3.5
6	.....	3.20	2.60	2.55	2.85	2.45	3.3	3.1	3.6
7	.....	3.20	2.50	2.40	2.85	.....	3.2	3.1	3.9
8	.....	3.20	2.60	2.40	2.75	2.50	3.2	3.1	3.6
9	.....	3.20	2.55	2.60	2.75	2.55	3.25	.....	3.4
10	.....	3.55	2.60	2.50	2.70	2.75	3.2	3.1	3.2
11	.....	3.60	2.75	2.75	2.60	2.80	3.35	3.1	3.2
12	.....	3.55	3.30	2.50	2.60	2.85	3.3	3.1	2.85
13	.....	3.50	3.35	2.85	2.60	2.80	3.3	3.1	2.8
14	3.80	3.55	3.45	2.80	2.65	.....	3.3	3.2	2.8
15	3.66	3.60	3.40	2.65	2.75	2.75	3.3	3.2	2.8
16	3.61	3.85	3.10	2.65	2.55	2.95	3.25	.....	2.75
17	3.65	4.00	3.30	2.55	.....	2.95	3.2	3.2	2.8
18	3.50	3.85	2.95	2.50	2.65	3.00	3.3	3.1	2.75
19	3.36	3.70	3.00	2.40	2.75	3.05	3.3	3.1	2.85
20	3.30	3.75	3.05	2.60	2.80	2.90	3.3	3.2	2.9
21	3.30	3.75	3.05	2.60	2.80	3.20	3.25	3.25	.....
22	3.30	3.65	3.00	2.60	2.75	3.40	3.3	3.1	.....
23	3.35	3.55	3.00	3.75	2.75	3.40	3.3	.....	.....
24	3.30	3.50	2.9	3.50	.....	3.40	3.3	3.1	.....
25	3.30	3.40	2.9	3.50	2.70	3.50	3.3	3.1	.....
26	3.20	3.40	2.80	3.45	2.60	3.50	3.3	3.1	.....
27	3.75	3.30	2.65	3.30	2.50	3.50	3.2	3.15	.....
28	3.65	3.30	2.65	3.30	2.50	3.50	3.2	3.2	.....
29	3.55	2.9	2.55	3.20	2.50	3.60	3.1	3.2	.....
30	3.50	2.8	2.50	3.00	2.40	3.50	3.2	.....	.....
31	.....	2.9	.....	.....	.....	.....	3.2	.....	.....

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Daily discharge, in second-feet, of North Platte River at North Platte, Nebr., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	2,990	1,240	824	1,600	340	2,650	1,500	1,820
2	.....	2,790	1,090	687	1,500	380	2,500	1,500	1,700
3	.....	2,760	1,160	928	1,440	380	2,470	1,500	2,100
4	.....	2,580	1,020	785	1,400	380	2,250	1,500	2,400
5	.....	2,400	900	654	1,360	480	1,950	1,500	2,550
6	.....	2,100	900	580	1,230	430	1,950	1,500	2,900
7	.....	2,050	780	420	1,190	455	1,700	1,500	4,050
8	.....	2,000	900	406	995	480	1,700	1,500	2,900
9	.....	1,950	840	570	965	530	1,820	1,500	2,250
10	.....	2,920	900	456	860	740	1,700	1,500	1,700
11	.....	3,060	1,090	687	704	800	2,100	1,500	1,700
12	.....	2,850	2,170	420	680	875	1,950	1,500	1,060
13	.....	2,670	2,320	759	660	800	1,950	1,500	980
14	5,000	2,760	2,620	665	692	680	1,950	1,700	980
15	4,440	2,880	2,470	635	788	740	1,950	1,700	980
16	4,200	4,120	1,700	653	550	1,060	1,820	1,700	915
17	4,320	4,800	2,170	582	586	1,080	1,700	1,700	980
18	3,760	4,120	2,320	558	630	1,210	1,950	1,500	915
19	3,190	3,500	1,460	496	740	1,340	1,950	1,500	1,060
20	2,960	3,700	1,540	680	800	1,100	1,950	1,700	1,130
21	2,930	3,700	1,520	700	800	1,750	1,820	1,820	.....
22	2,860	3,300	1,410	720	740	2,370	1,950	1,500	.....
23	2,990	2,940	1,380	3,140	740	2,400	1,950	1,500	.....
24	2,800	2,770	1,210	2,410	710	2,430	1,950	1,500	.....
25	2,740	2,470	1,210	2,470	680	2,790	1,950	1,500	.....
26	2,410	2,470	1,050	2,380	580	2,790	1,950	1,500	.....
27	4,240	2,170	852	2,020	480	2,790	1,700	1,600	.....
28	3,760	2,170	852	2,070	480	2,800	1,700	1,700	.....
29	3,380	1,320	736	1,920	480	3,080	1,500	1,700	.....
30	3,200	1,160	600	1,600	380	2,700	1,700	1,730	.....
31	.....	1,320	.....	1,600	380	.....	1,700	.....	.....

NOTE.—Daily discharge determined from a series of parallel curves and by indirect method for shifting channels.

Monthly discharge of North Platte River at North Platte, Nebr., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
Apr. 14-30	5,000	2,410	3,480	117,000	C.
May	4,800	1,160	2,740	168,000	C.
June	2,620	600	1,320	78,600	C.
July	3,140	406	1,080	66,400	C.
August	1,600	380	833	51,200	C.
September	3,080	340	1,340	79,700	C.
October	2,650	1,500	1,930	119,000	B.
November	1,820	1,500	1,540	91,600	B.
Dec. 1-20	4,050	915	1,750	69,400	B.
The period	.....	.....	.....	841,000	

PLATTE RIVER NEAR COLUMBUS, NEBR.

Location.—At Meridian Bridge, 3 miles south of Columbus, on line between sec. 36, T. 17 N., R. 1 W., and sec. 31, T. 17 N., R. 1 E., about 10 miles below mouth of Prairie Creek, and 5 miles above mouth of Loup River.

Records available.—June 4, 1895, to December 31, 1913.

Drainage area.—56,900 square miles.

Gage.—Chain gage installed July 25, 1910. The bridge and the original gage previously used were washed out early in 1910. The new gage is at the same point as the old, but its datum is possibly slightly different. The datum of the original gage was unchanged up to the time of its destruction.

Control.—Extremely shifting; at this point the river flows in the channels known as the main, middle, and south channels. The gage is in main channel.

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Discharge measurements.—Made from bridges spanning each channel.

Winter flow.—River freezes over; observations discontinued.

Diversions.—Prior to September 1, 1912, there were approved diversions of 4,888 second-feet for irrigation and 1,500 second-feet for power from Platte River between junction of the two branches and Columbus, and this diversion, together with the evaporation from the wide shallow channels, frequently causes the flow to cease at this point during the late summer and fall.

Accuracy.—Results for 1913 should be fair.

Cooperation.—Station maintained in cooperation with State engineer, by whom the field data were furnished.

Discharge measurements of Platte River near Columbus, Nebr., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 19	D. P. Weeks, jr	3.60	5,110	June 18	D. P. Weeks, jr	1.60	14
Apr. 6	do	3.90	5,120	25	do	2.20	326
13	do	4.15	6,710	July 2	do	1.80	[a] 40
20	do	3.60	3,930	10	do		[b] 0
27	do	3.85	5,160	28	do		[b] 0
May 4	do	3.75	4,070	Nov. 23	Weeks and Jefferys	2.29	312
11	do	3.40	3,000	29	W. M. Jefferys	2.35	844
18	do	3.30	2,370	Dec. 12	do	[c] 3.40	274
25	do	3.60	3,070	20	do		[d]
June 8	do	3.10	1,610				

[a] Discharge estimated.
[b] River dry.
[c] Relation of gage height to discharge affected by ice.
[d] No measurement; river frozen.

Daily gage height, in feet, of Platte River near Columbus, Nebr., for 1913.

[W. B. Benson, observer.]

Day.	Mar.	Apr.	May.	June.	Oct.	Nov.	Dec.
1		4.0		2.95		2.7	2.85
2		4.0		2.75		2.55	2.85
3		4.15	4.75	2.65		2.6	3.0
4		4.2	3.95	2.65		2.75	
5		4.0	3.9	2.7		2.85	
6		3.85		2.9		2.9	3.8
7		3.55	3.55	3.0			3.8
8		3.4	3.4	3.1	2.2	2.35	3.65
9		3.5	3.6	2.75	3.22	1.95	3.25
10		4.05	3.5	2.55	2.4	2.15	3.0
11		4.05	3.4	2.25	2.3	2.0	3.35
12		4.0	3.3	2.0		1.85	3.45
13		4.1	3.35	2.0		1.85	3.2
14		3.9	3.35	1.75		2.1	3.4
15		3.8	3.25	1.6		2.25	3.35
16		3.8	3.3	1.8		2.4	3.2
17		3.8	3.35	1.7		2.4	2.65
18		3.7	3.3	1.5		2.4	2.7
19	3.60	3.6		1.25		2.35	
20		3.55	3.35			2.45	2.45
21		3.4	3.5	2.65		2.5	
22		3.3	3.7	2.6	2.4		
23	3.15		3.6	2.3	2.4	2.35	
24	3.1	3.8	3.55	2.5	2.5	2.5	
25	3.3	4.0	3.6	2.0	2.5		
26	3.15	3.85	3.4	2.0	2.5	2.45	
27	3.0	3.7	3.3		2.7	2.45	
28	2.85	3.65	3.15	2.0			
29	4.05	3.45	3.0		2.3	2.4	
30	3.45	3.45	2.8	1.85		2.8	
31	4.2		2.75		2.6		

NOTE.—River dry July 1 to Oct. 7, and during at least a part of the period from Oct. 12 to 21. Ice present during last half of December.

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Daily discharge, in second-feet, of Platte River near Columbus, Nebr., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Oct.	Nov.	Dec.
1	.....	5,800	3,000	1,320	70	.....	850	1,800
2	.....	5,800	4,000	925	40	.....	638	1,800
3	.....	6,720	10,600	775	35	.....	700	2,300
4	.....	7,050	5,500	775	30	.....	925	.....
5	.....	5,800	5,200	850	25	.....	1,100	.....
6	.....	4,920	4,290	1,200	20	.....	1,200	.....
7	.....	3,380	3,380	1,450	15	.....	810	.....
8	.....	2,750	2,750	1,750	10	300	420	.....
9	.....	3 150	3 600	925	5	2,120	145	.....
10	.....	6 100	3 150	638	.....	465	262	.....
11	.....	6,100	2,750	338	.....	375	170	.....
12	.....	5,800	2,400	170	.....	325	98	.....
13	.....	6,400	2,580	170	.....	270	98	.....
14	.....	5,200	2,580	58	.....	215	225	.....
15	.....	4,650	2,220	20	.....	160	338	.....
16	.....	4,650	2,400	75	.....	105	465	.....
17	.....	4,650	2,580	40	.....	50	465	.....
18	.....	4,100	2,400	10	.....	.....	465	.....
19	5,110	3,600	2,490	.....	.....	.....	420	.....
20	4,450	3,380	2,580	388	.....	155	520	.....
21	3,800	2,750	3,150	775	.....	310	575	.....
22	3,150	2,400	4,100	700	.....	465	498	.....
23	2,500	3,520	3,600	375	.....	465	420	.....
24	2,260	4,650	3,380	575	.....	575	640	.....
25	2,910	5,800	3,600	170	.....	575	685	.....
26	2,300	4,920	2,750	170	.....	575	730	.....
27	1,750	4,100	2,400	170	.....	850	820	.....
28	1,280	3,850	1,900	170	.....	612	872	.....
29	6,460	2,950	1,450	134	.....	375	900	.....
30	3,110	2,950	1,000	98	.....	538	1,650	.....
31	7,180	.....	925	.....	.....	700	.....	.....

NOTE.—Discharge determined as follows: Mar. 19–31 and Nov. 24–28, by indirect method; Apr. 1 to Nov. 23, from a well-defined rating curve; Nov. 24–28, from a curve based on one measurement. Discharge interpolated for days for which gage heights are missing. Observer records zero flow during July, August, and September. However, a discharge measurement of July 2 gives 40 second-feet, and there may have been a slight flow until July 10, when hydrographer found stream dry.

Monthly discharge of Platte River near Columbus, Nebr., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 19–31	7,180	1,280	3,560	91,800	C.
April	7,050	2,400	4,600	274,000	B.
May 3–31	10,600	925	3,180	196,000	B.
June	1,750	.....	507	30,200	B.
October	2,120	.....	341	21,000	C.
November	1,650	98	603	35,900	C.
December	.....	.....	a 500	30,700	D.

a Estimated.

PLATTE RIVER NEAR FREMONT, NEBR.

Location.—At highway bridge 1½ miles south of Fremont, in sec. 35, T. 17 N., R. 8 E.

Records available.—April 12 to November 7, 1913.

Drainage area.—Not measured.

Gage.—Painted on south abutment of bridge. Second gage established July 28, 1913, with datum 2.00 feet lower. All previous readings reduced to second datum.

Control.—Shifting.

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Discharge measurements.—Made from bridge.
Winter flow.—No data.
Diversions.—Prior to September 1, 1912, there were approved diversions of 2,500 second-feet for power and irrigation and 4,000 second-feet for power from Platte River between the mouth of Loup River and this station. Below there were approved diversions of 2,500 second-feet for power.
Accuracy.—Measurements insufficient for estimates of discharge.
Cooperation.—Field data furnished by the State engineer.

Discharge measurements of Platte River near Fremont, Nebr., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
July 10	Weeks and Leonard	1.90	2,450	Sept. 8	D. P. Weeks, jr.	1.65	1,510
Aug. 9	D. P. Weeks, jr.	1.40	1,290	11	Weeks and Leonard	1.72	1,690
27	G. K. Leonard	1.70	1,710	17	G. K. Leonard	1.85	1,890

Daily gage height, in feet, of Platte River near Fremont, Nebr., for 1913.

[G. K. Leonard, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	2.72	.....	1.65	1.62	1.54	2.05	2.00
2	.....	2.85	2.60	1.65	1.58	1.52	2.00	.....
3	.....	3.58	2.92	1.75	.....	1.55	1.95	2.00
4	.....	3.48	2.70	.....	1.50	1.55	1.95	2.00
5	.....	3.28	2.60	.....	1.40	1.55	.....	2.20
6	.....	3.15	2.90	.....	1.40	1.55	.....	2.35
7	.....	2.88	2.70	2.35	1.42	.....	.....	2.35
8	.....	2.90	.....	2.12	1.40	1.60	.....	.....
9	.....	2.80	2.61	1.85	1.40	1.65	.....	.....
10	.....	2.90	2.35	1.85	.....	1.66	2.10	.....
11	.....	.....	2.22	1.95	1.72	1.74	2.12	.....
12	3.40	2.95	2.11	1.80	1.76	1.74	.....	.....
13	.....	2.95	1.94	.....	1.95	1.73	2.10	.....
14	3.32	2.98	2.00	1.68	1.99	.....	2.11	.....
15	3.19	2.92	.....	1.66	1.90	1.92	2.10	.....
16	3.26	2.92	.....	1.70	2.05	1.85	2.00	.....
17	3.15	2.93	2.15	1.65	2.45	1.83	2.00	.....
18	3.11	2.95	2.22	1.60	.....	1.75	.....	.....
19	3.09	.....	2.16	1.59	2.00	1.70	.....	.....
20	.....	.....	2.00	1.50	1.85	1.70	.....	.....
21	2.88	3.05	2.75	1.60	1.78	1.70	2.12	.....
22	2.85	3.00	.....	1.65	1.70	1.75	2.29	.....
23	2.60	2.90	2.50	1.95	1.66	1.82	2.40	.....
24	3.08	.....	2.50	1.85	.....	.....	2.26	.....
25	3.35	.....	2.34	1.68	1.69	1.97	2.20	.....
26	.....	2.78	2.20	1.70	1.70	1.99	.....	.....
27	3.30	2.70	1.95	.....	1.70	1.95	2.20	.....
28	.....	2.62	1.81	1.68	1.66	.....	.....	.....
29	2.98	2.45	.....	1.65	1.60	1.97	2.35	.....
30	2.84	2.35	1.80	1.65	1.59	2.05	2.15	.....
31	.....	2.28	.....	1.62	.....	.....	2.00	.....

PLATTE RIVER NEAR LESHARA, NEBR.

Location.—Two miles southeast of Leshara, in sec. 34, T. 16 N., R. 9 E., 7 miles above entrance of Otoe Creek.
Records available.—May 19, 1911, to July 19, 1913.
Drainage area.—Not measured.
Gage.—Chain.

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Control.—Extremely shifting.

Discharge measurements.—Made from highway bridge.

Winter flow.—Data too meager to determine.

Diversions.—Prior to September 1, 1912, there were approved diversions of 2,500 second-feet for power and irrigation and 4,000 second-feet for power from Platte River between the mouth of Loup River and this station. Below there were approved diversions of 2,500 second-feet for power.

Accuracy.—Estimates obtained by indirect method for shifting channels and can be considered only fair.

Cooperation.—Field data furnished by State engineer.

Discharge measurements of Platte River near Leshara, Nebr., in 1913.

[D. P. Weeks, jr., hydrographer.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Mar. 17	3.45	6,380	May 30	3.90	12,000	June 7	3.42	5,900
Apr. 12	4.10	11,700	10	3.80	7,630	17	2.75	2,210
19	3.88	8,750	17	3.80	8,280	28	2.65	2,300
26	4.17	12,100	24	3.72	7,890	July 3	2.45	2,130

Daily gage height, in feet, and discharge, in second-feet, of Platte River near Leshara, Nebr., for 1913.

[H. W. Eggers, observer.]

Day.	March.		April.		May.		June.		July.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	4.20	11,500	3.80	11,100	3.04	4,590	2.54	2,230
2	.....	.....	4.00	10,300	3.82	11,500	3.15	4,990	2.42	2,010
3	.....	.....	3.80	9,240	3.90	12,000	3.50	6,400	2.45	2,130
4	.....	.....	4.17	11,500	4.35	14,100	3.45	6,130	2.60	2,500
5	.....	.....	4.25	12,100	4.07	11,800	3.40	5,870	2.63	2,590
6	.....	.....	4.10	11,200	3.20	6,580	3.44	6,000	2.60	2,500
7	.....	.....	4.00	10,700	3.85	9,350	3.42	5,900	2.54	2,350
8	.....	.....	3.85	9,840	3.86	8,860	3.40	5,620	2.85	3,250
9	.....	.....	3.88	10,100	3.90	8,550	3.35	5,220	2.80	3,100
10	4.50	.....	3.90	10,300	3.80	7,630	3.28	4,740	2.63	2,590
11	4.28	.....	4.00	11,000	3.70	7,300	3.00	3,590	2.66	2,680
12	4.60	.....	4.10	11,700	3.85	8,150	2.80	2,800	2.70	2,800
13	4.20	.....	4.05	11,100	3.75	7,750	2.70	2,450	2.65	2,650
14	4.26	.....	4.25	12,000	3.78	8,000	2.65	2,240	2.60	2,500
15	4.08	.....	4.15	11,100	3.90	8,700	2.60	2,060	2.55	2,380
16	3.55	.....	4.00	9,990	3.70	7,800	2.65	2,080	2.70	2,800
17	3.45	6,380	3.60	7,550	3.80	8,300	2.75	2,210	2.57	2,420
18	3.20	5,340	3.90	8,800	3.67	7,650	2.80	2,430	2.50	2,250
19	3.00	4,620	3.88	8,750	3.65	7,550	2.65	2,050	2.40	2,050
20	3.40	6,300	3.8	8,300	3.71	7,850	2.80	2,490	.....	.....
21	4.00	9,400	3.73	8,200	3.80	8,300	2.83	2,610	.....	.....
22	3.10	5,180	3.75	8,550	3.66	7,600	3.60	5,680	.....	.....
23	3.09	5,220	3.83	9,240	3.75	8,050	3.13	3,720	.....	.....
24	3.35	6,350	3.90	9,900	3.72	7,900	3.30	4,430	.....	.....
25	3.55	7,350	4.10	11,400	3.65	7,500	3.00	3,330	.....	.....
26	3.50	7,200	4.17	12,100	3.63	7,350	2.90	3,020	.....	.....
27	3.20	5,860	4.05	11,400	3.56	6,980	2.70	2,400	.....	.....
28	3.15	5,740	4.00	11,400	3.35	6,000	2.65	2,300	.....	.....
29	3.35	6,660	3.83	10,700	3.28	5,670	2.55	2,100	.....	.....
30	3.95	9,840	3.58	9,520	3.16	5,150	2.60	2,320	.....	.....
31	3.80	9,080	.....	.....	3.10	4,870	.....	.....	.....	.....

NOTE.—Daily discharge determined from a series of parallel curves and by indirect method for shifting channels.

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Monthly discharge of Platte River near Leshara, Nebr., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 17-31	9,840	4,620	6,700	199,000	C.
April	12,100	7,550	10,300	613,000	C.
May	14,100	4,870	8,250	507,000	C.
June	6,400	2,050	3,730	222,000	C.
July 1-19	3,250	2,010	2,510	94,600	C.
The period				1,640,000	

NORTH SPRING CREEK NEAR SARATOGA, WYO.

Location.—At Boock's ranch, in sec. 19, T. 16 N., R. 85 W., 14 miles southwest of Saratoga. Nearest tributary, Methodist Creek, enters a few miles below.

Record available.—August 23 to October 30, 1913.

Drainage area.—Not measured.

Gage.—Vertical staff.

Control.—Data too meager to determine.

Discharge measurements.—Made by wading.

Winter flow.—No data.

Diversions.—Prior to July 1, 1914, there were adjudicated diversions of 78 second-feet from North Spring Creek. It is not known what part of these is above the station.

Accuracy.—Only base data available, as the station has not been completely rated. These data are considered reliable.

Cooperation.—Station maintained in cooperation with Sierra Madre Land & Water Co.

Discharge measurements of North Spring Creek near Saratoga, Wyo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Aug. 23	Robert Follansbee	0.55	9.3
Oct. 30	R. H. Fletcher	.50	4.2

Daily gage height, in feet, of North Spring Creek near Saratoga, Wyo., for 1913.

[R. A. Ainsworth, observer.]

Day.	Aug.	Sept.	Oct.	Day.	Aug.	Sept.	Oct.	Day.	Aug.	Sept.	Oct.
1	.....	0.55	0.45	11	.....	0.55	0.55	21	.....	0.55	.....
2	.....	.55	.45	12	.....	.55	.55	22	.....	.55	.....
3	.....	.55	.45	13	.....	.55	.55	23	0.55	.55	.....
4	.....	.55	.45	14	.....	.55	.50	24	.55	.55	.....
5	.....	.62	.45	15	.....	.55	.46	25	.55	.55	.....
6	.....	.55	.51	16	.....	.55	.45	26	.58	.51	.....
7	.....	.55	.55	17	.....	.55	.45	27	.58	.50	.....
8	.....	.55	.55	18	.....	.55	.45	28	.55	.45	.....
9	.....	.65	.55	19	.....	.55	.45	29	.55	.....	.....
10	.....	.55	.55	20	.....	.55	.....	30	.55	.....	0.50
								31	.56	.....	.....

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JACK CREEK AT MATHESON'S RANCH, NEAR SARATOGA, WYO.

Location.—At Matheson's ranch, about sec. 36, T. 17 N., R. 86 W., about 14 miles southwest of Saratoga. Nearest tributary, North Jack Creek, enters some distance below.

Records available.—August 23 to November 21, 1913.

Drainage area.—Not measured.

Gage.—Vertical staff.

Control.—Data too meager to determine.

Discharge measurements.—Made from footbridge during high water and by wading at ordinary stages.

Winter flow.—Ice causes backwater; records discontinued.

Diversions.—Prior to July 1, 1914, there were adjudicated diversions of 95 second-feet from Jack Creek. It is not known what part of these is above the station.

Accuracy.—Base data only available, as station has not been completely rated. These data are considered reliable.

Cooperation.—Station maintained in cooperation with the Sierra Madre Land & Water Co.

Discharge measurements of Jack Creek at Matheson's ranch, near Saratoga, Wyo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Aug. 23	Robert Follansbee	.....	[a] 2.5
Oct. 31	R. H. Fletcher	0.52	6.5

[a] Estimated.

Daily gage height, in feet, of Jack Creek at Matheson's ranch, near Saratoga, Wyo., for 1913.

Day.	Aug.	Sept.	Oct.	Nov.	Day.	Aug.	Sept.	Oct.	Nov.
1	.....	0.38	0.44	0.50	16	.....	0.36	0.48	0.40
2	.....	.38	.48	.52	17	.....	.36	.51	.52
3	.....	.35	.46	.55	18	.....	.35	.46	.51
4	.....	.38	.40	.52	19	.....	.35	.52	.52
5	.....	.39	.62	.....	20	.....	.36	.50	.52
6	.....	.40	.52	.50	21	.....	.35	.52	.48
7	.....	.39	.46	.48	22	.....	.38	.50	.....
8	.....	.40	.51	.48	23	0.32	.40	.49	.....
9	.....	.45	.52	.45	24	.30	.41	.50	.....
10	.....	.45	.49	.50	25	.30	.40	.56	.....
11	.....	.39	.50	.46	26	.29	.41	.48	.....
12	.....	.39	.49	.58	27	.32	.41	.55	.....
13	.....	.36	.56	.56	28	.34	.40	.....	.....
14	.....	.36	.59	.52	29	.35	.42	.55	.....
15	.....	.41	.55	.40	30	.36	.44	.52	.....
					31	.40	.....	.52	.....

ROCK CREEK NEAR ARLINGTON, WYO.

Location.—At highway bridge in sec. 25, T. 19 N., R. 79 W., 1½ miles upstream from Arlington post office; 1 mile below the mouth of Overland Creek, the nearest tributary.

Records available.—April 22, 1911, to December 2, 1913.

Drainage area.—70 square miles (measured from Forest atlas).

Gage.—Bristol automatic gage referred to same datum as original gage.

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Control.—Shifting.

Discharge measurements.—Made from bridge.

Winter flow.—Ice causes backwater during winter months; records discontinued.

Diversions.—One small ditch diverts water above the station for irrigation.

Accuracy.—Estimates obtained by indirect method for shifting channels, and can be considered only fair, except for months when measurements indicated no shift, for which they are probably good.

Cooperation.—Field data furnished through courtesy of Rock Creek Conservation Co., which maintained station.

Discharge measurements of Rock Creek near Arlington, Wyo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Jan. 4	Cummings and Gordon.	1.2	24	July 4	F. T. Cummings	1.95	107
May 3	do	1.9	119	13	do	1.6	54
	C. E. Turner	2.6	289	29	do	1.55	43
19	F. T. Cummings	2.8	280	Aug. 5	do	1.4	30
June 2	do	3.0	577	13	do	1.3	26
12	do	2.6	432	Dec. 6	Cummings and Gordon		15
18	do	2.45	303	Sept. 1	M. N. Grant	1.3	13

Daily gage height, in feet, of Rock Creek near Arlington, Wyo., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		1.30	1.85	3.20	2.08	1.48	1.28	1.30	1.30	1.67
2		1.25	1.85	3.20	2.04	1.50	1.30	1.26	1.30	1.82
3		.85	1.80	3.05	1.98	1.55	1.30	1.26	1.34	
4		.80	1.75	2.95	1.96	1.55	1.28	1.37	1.35	
5		.80	1.76	2.90	1.94	1.68	1.44	1.46	1.31	
6		.90	1.85	2.85	1.90	1.72	1.35	1.40	1.26	
7		.85	2.05	2.80	1.94	1.52	1.36	1.28	1.27	
8		.80	2.02	2.65	1.85	1.50	1.42	1.35	1.36	
9		.70	2.05	2.80	1.85	1.47	1.44	1.28	1.30	
10		.90	2.20	2.95	1.80	1.46	1.38	1.25	1.27	
11		.95	2.35	2.90	1.85	1.45	1.30	1.37	1.30	
12		.80	2.65	2.65	1.80	1.46	1.28	1.33	1.26	
13		.95	2.76	2.50	1.76	1.40	1.28	1.38	1.26	
14		1.00	2.65	2.70	1.77	1.37	1.29	1.40	1.26	
15		1.10	2.50	2.85	1.73	1.35	1.30	1.35	1.30	
16		1.00	2.45	2.80	1.71	1.32	1.30	1.27	1.40	
17		.97	2.35	2.65	1.76	1.31	1.30	1.20	1.30	
18		1.00	2.65	2.65	1.70	1.33	1.27	1.22	1.30	
19	0.93	1.00	2.75	2.65	1.69	1.30	1.25	1.30	1.28	
20	.90	1.05	2.55	2.50	1.68	1.30	1.25	1.34	1.28	
21	.86	1.00	2.45	2.45	1.68	1.28	1.26	1.30	1.30	
22	.90	1.12	2.45	2.45	1.70	1.28	1.28	1.30	1.58	
23	.95	1.00	2.70	2.45	1.81	1.28	1.28	1.30	1.68	
24	.92	1.00	3.00	2.45	1.78	1.28	1.28	1.30	1.56	
25	.85	.92	3.20	2.55	1.67	1.28	1.22	1.27	1.52	
26	.80	1.13	3.40	2.50	1.62	1.28	1.27	1.32	1.45	
27	.80	1.40	3.45	2.30	1.60	1.26	1.30	1.47	1.41	
28	.80	1.51	3.25	2.25	1.60	1.24	1.30	1.31	1.33	
29	.82	1.75	3.25	2.25	1.58	1.23	1.30	1.45	1.62	
30	.80	1.80	3.35	2.12	1.50	1.24	1.28	1.32	1.64	
31	.90		3.40		1.50	1.26		1.30		

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Daily discharge, in second-feet, of Rock Creek near Arlington, Wyo., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	36	110	680	142	38	12	13	13	.....
2	.....	31	110	680	130	40	13	11	13	.....
3	.....	8	100	600	116	45	13	11	15	.....
4	.....	6	92	555	108	45	12	16	16	.....
5	.....	6	94	535	104	61	21	22	14	.....
6	.....	10	110	515	97	67	16	18	11	.....
7	.....	8	150	495	104	42	16	12	12	.....
8	.....	6	144	232	88	40	19	16	16	.....
9	.....	4	150	505	88	37	21	12	13	.....
10	.....	10	180	585	80	36	17	10	12	.....
11	.....	12	218	565	88	35	13	16	13	.....
12	.....	6	308	450	80	36	12	14	11	.....
13	.....	12	346	377	74	30	12	17	11	.....
14	.....	14	308	457	75	28	12	18	11	.....
15	.....	18	245	472	69	26	13	16	13	.....
16	.....	14	218	475	66	24	13	12	18	.....
17	.....	13	180	390	74	23	13	8	13	.....
18	.....	14	245	385	64	23	12	9	13	.....
19	11	14	268	385	63	20	10	13	12	.....
20	10	16	200	321	61	19	10	15	12	.....
21	8	14	172	298	61	16	11	13	13	.....
22	10	20	172	294	64	16	12	13	.....	.....
23	12	14	268	291	82	16	12	13	.....	.....
24	11	14	405	288	77	15	12	13	15	.....
25	8	11	520	317	60	14	9	12	.....	.....
26	6	20	650	291	53	14	12	14	.....	.....
27	6	46	710	222	50	12	13	23	.....	.....
28	6	59	622	201	50	11	13	14	.....	.....
29	7	92	650	195	48	10	13	22	.....	.....
30	6	100	740	155	40	10	12	14	.....	.....
31	10	.....	800	.....	40	10	.....	13	.....	.....

NOTE.—Discharge determined from a series of fairly well defined parallel curves and by indirect method.

Monthly discharge of Rock Creek near Arlington, Wyo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 19–31	12	6	8.5	219	C.
April	100	6	21.6	1,290	C.
May	800	92	306	18,800	B.
June	680	155	407	24,200	B.
July	142	40	77.3	4,750	A.
August	67	10	27.7	1,700	A.
September	21	9	13.3	791	B.
October	23	8	14.3	879	B.
November	.....	.....	13.7	815	C.
The period	.....	.....	.....	53,400	

SWEETWATER RIVER NEAR ALCOVA, WYO.

Location.—At Schoonmaker's ranch, in sec. 17, T. 29 N., R. 86 W., 27 miles west of Alcova. Backwater from Pathfinder reservoir comes to a point 5 miles below. Nearest tributary, Dry Creek, enters 6 miles below.

Records available.—August 28 to December 1, 1913.

Drainage area.—Not measured.

Gage.—Vertical staff.

Control.—Data too meager to determine.

Discharge measurements.—Made from bridge one-fourth mile below during high water and by wading at low stages.

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Winter flow.—Ice causes backwater; records discontinued.

Diversions.—Prior to July 1, 1912, there were adjudicated diversions of 120 second-feet from Sweetwater River, all above the station. There were also diversions of 84 second-feet from tributaries entering above.

Accuracy.—Field data only available, as the station has not been completely rated. These data are considered reliable.

Cooperation.—Station maintained in cooperation with United States Reclamation Service.

Discharge measurements of Sweetwater Creek near Alcova, Wyo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Aug. 28	Robert Follansbee	0.50	24.6
Oct. 14	R. H. Fletcher	.69	52.9

Daily gage height, in feet, of Sweetwater River near Alcova, Wyo., for 1913.

[Oliver W. Stevens, observer.]

Day.	Aug.	Sept.	Oct.	Nov.	Dec.	Day.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	0.52	0.70	0.70	0.70	16	.....	0.50	0.70	0.70	.....
2	.....	.50	.70	.70	.....	17	.....	.50	.70	.70	.....
3	.....	.52	.70	.70	.....	18	.....	.50	.70	.70	.....
4	.....	.52	.70	.70	.....	19	.....	.50	.70	.70	.....
5	.....	.52	.70	.70	.....	20	.....	.52	.70	.70	.....
6	.....	.52	.70	.70	.....	21	.....	.52	.70	.70	.....
7	.....	.50	.70	.70	.....	22	.....	.52	.70	.70	.....
8	.....	.50	.70	.70	.....	23	.....	.52	.70	.85	.....
9	.....	.50	.70	.70	.....	24	.....	.52	.70	.70	.....
10	.....	.50	.70	.70	.....	25	.....	.55	.70	.70	.....
11	.....	.50	.70	.70	.....	26	.....	.55	.72	.70	.....
12	.....	.50	.70	.70	.....	27	.....	.60	.75	.70	.....
13	.....	.50	.70	.69	.....	28	0.50	.60	.72	.70	.....
14	.....	.50	.70	.70	.....	29	.50	.60	.71	.70	.....
15	.....	.50	.70	.70	.....	30	.52	.65	.70	.70	.....
						31	.55	.....	.70	.....	.....

LARAMIE RIVER AT GLENDEVEY, COLO.

Location.—At highway bridge one-eighth mile west of Glendevey, in sec. 36, T. 10 N., R. 76 W., in Medicine Bow National Forest. McIntyre Creek enters a short distance below and Spring Creek above.

Records available.—June 24, 1904, to October 31, 1905; August 18, 1910, to October 19, 1913.

Drainage area.—102 square miles (measured from Clason's 1911 sectional map of Colorado).

Gage.—Automatic gage installed by State engineer November 17, 1910; replaced vertical staff previously used. The datum of gages has remained constant.

Control.—Permanent.

Discharge measurements.—Made from cable at bridge during high water and by wading at ordinary stages.

Winter flow.—Ice causes backwater during winter months; records discontinued.

Diversions.—There are court decrees for diversions of 65 second-feet from Laramie River above the station and for 749 second-feet from tributaries entering above. Of the latter amount, 688 second-feet is for diversion into the Cache la Poudre basin. During 1913 a total of 15,200 acre-feet were diverted to the Cache la Poudre.

Cooperation.—Complete records since 1911 furnished by State engineer.

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Discharge measurements of Laramie River at Glendevey, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 26	Thos. Grieve	2.10	48	Aug. 2	Thos. Grieve	2.10	44
May 9	do	2.68	202	11	M. E. Bunger	2.05	29
26	do	3.02	297	17	R. I. Meeker	2.00	30
June 7	do	2.80	219	Sept. 10	M. E. Bunger	2.00	33
20	do	2.65	175	27	do	2.10	38.5
July 23	R. I. Meeker	2.36	84	Oct. 12	R. I. Meeker	2.10	41
29	Thos. Grieve	2.20	53				

Daily gage height, in feet, of Laramie River at Glendevey, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	2.55	3.15	2.35	2.1	1.9	2.05
2	.....	2.45	3.0	2.3	2.1	1.85	2.05
3	.....	2.4	3.0	2.3	2.05	1.9	2.05
4	.....	2.35	2.95	2.3	2.1	1.85	2.2
5	.....	2.4	2.9	2.3	2.1	1.9	2.2
6	.....	2.5	2.95	2.25	2.05	1.95	2.1
7	.....	2.7	2.85	2.2	2.05	2.0	2.05
8	.....	2.55	2.75	2.25	2.05	2.0	2.05
9	.....	2.65	2.8	2.25	2.05	2.0	2.0
10	.....	2.8	2.85	2.3	2.0	2.0	2.0
11	.....	2.85	2.9	2.3	2.0	1.95	2.0
12	.....	2.9	2.75	2.25	2.0	1.95	2.0
13	.....	2.85	2.7	2.2	2.0	1.95	2.0
14	.....	2.65	2.65	2.15	2.0	1.9	2.05
15	.....	2.65	2.65	2.15	2.0	1.9	2.0
16	.....	2.6	2.65	2.15	2.0	1.9	2.0
17	.....	2.65	2.65	2.2	2.0	1.9	2.0
18	.....	2.7	2.65	2.3	1.95	1.9	1.9
19	.....	2.7	2.75	2.3	1.95	1.9	1.9
20	.....	2.6	2.7	2.2	1.95	1.85	.....
21	2.3	2.55	2.65	2.15	1.9	1.9	.....
22	2.35	2.5	2.65	2.15	1.95	1.9	.....
23	2.2	2.6	2.55	2.3	1.95	2.0	.....
24	2.15	2.7	2.5	2.5	2.0	2.0	.....
25	2.15	2.8	2.65	2.35	1.95	2.0	.....
26	2.1	2.9	2.6	2.3	1.95	2.0	.....
27	2.25	3.1	2.5	2.25	1.95	2.05	.....
28	2.45	3.1	2.5	2.2	1.95	2.0	.....
29	2.55	3.1	2.5	2.15	2.0	2.0	.....
30	2.55	3.15	2.4	2.15	2.0	2.05	.....
31	.....	3.2	.....	2.1	2.0	.....	.....

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Daily discharge, in second-feet, of Laramie River at Glendevey, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.
1	.....	142	342	85	40	25	36
2	.....	112	290	72	40	22	36
3	.....	98	290	72	36	25	36
4	.....	85	272	72	40	22	54
5	.....	98	255	72	40	25	54
6	.....	127	272	63	36	28	40
7	.....	189	238	54	36	31	36
8	.....	142	206	63	36	31	36
9	.....	173	222	63	36	31	31
10	.....	222	238	72	31	31	31
11	.....	238	255	72	31	28	31
12	.....	255	206	63	31	28	31
13	.....	238	189	54	31	28	31
14	.....	173	174	47	31	25	36
15	.....	173	174	47	31	25	31
16	.....	158	174	47	31	25	31
17	.....	173	174	54	31	25	31
18	.....	189	174	72	28	25	25
19	.....	189	206	72	28	25	25
20	.....	158	189	54	28	22	.....
21	72	142	174	47	25	25	.....
22	85	127	174	47	28	25	.....
23	54	158	142	72	28	31	.....
24	47	189	127	127	31	31	.....
25	47	222	174	85	28	31	.....
26	40	255	158	72	28	31	.....
27	63	325	127	63	28	36	.....
28	112	325	127	54	28	31	.....
29	142	325	127	47	31	31	.....
30	142	342	98	47	31	36	.....
31	.....	360	.....	40	31	.....	.....

Monthly discharge of Laramie River at Glendevey, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
April 21–30	142	40	80.4	1,590
May	360	85	197	12,100
June	342	98	199	11,800
July	127	40	63.6	3,910
August	40	25	31.9	1,960
September	36	22	27.8	1,650
October 1–19	54	25	34.8	1,310
The period	.....	.....	.....	34,230

LARAMIE RIVER NEAR JELM, WYO.

Location.—At Boswell's ranch, in sec. 15, T. 12 N., R. 77 W., 4 miles south of Jelm post office, one-fourth mile below Colorado-Wyoming line.

Records available.—May 7, 1911, to November 30, 1913. From June 22, 1904, to October 31, 1905, a station was maintained at Decker's ranch, one-half mile south of State line. The records at the two stations are practically comparable, as there are no tributaries nor diversions of any consequence between.

Drainage area.—365 square miles (Clason's 1911 sectional map of Colorado).

Gage.—In 1911 an automatic recording gage was installed by the State engineer of Colorado. This is referred to same datum as the vertical staff used at first.

Control.—Practically permanent.

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Discharge measurements.—Made from bridge at ordinary stages; low-water measurements made by wading.

Winter flow.—Ice causes backwater during winter months; records discontinued.

Diversions.—Between this station and that at Glendevey, Colo., there are court decrees for diversions of 236 second-feet from Laramie River and 204 second-feet from intervening tributaries. These diversions are all in Colorado.

Accuracy.—Conditions are favorable for accurate results; estimates should be excellent.

Cooperation.—Complete records furnished by State engineer of Colorado.

Discharge measurements of Laramie River near Jelm, Wyo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Apr. 24	R. I. Meeker	1.30	114	June 15	Thos. Grieve	2.05	380
24	Thos. Grieve	1.45	140	21	C. E. Turner	1.97	334
25	....do	1.34	128	July 22	R. I. Meeker	1.36	113
27	....do	1.40	136	Aug. 9	M. E. Bunger	1.15	63
29	....do	1.70	252	17	R. I. Meeker	1.02	44
May 8	....do	2.20	467	Sept. 2	Robert Follansbee	.99	41
14	R. I. Meeker	2.35	514	2	M. E. Bunger	1.00	39
22	C. E. Turner	2.06	371	30	....do	1.22	76
24	Thos. Grieve	2.45	599	Oct. 3	....do	1.22	78
28	....do	2.72	777	12	R. I. Meeker	1.20	78
30	R. I. Meeker	2.82	850	Nov. 25	....do	1.06	66

Daily gage height, in feet, of Laramie River near Jelm, Wyo., for 1913.

[C. D. Oviatt, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	2.0	2.8	1.6	1.3	1.0	1.15	1.1
2	.....	1.95	2.65	1.55	1.25	.95	1.15	1.1
3	.....	1.8	2.55	1.5	1.2	.90	1.15	1.1
4	.....	1.75	2.55	1.5	1.2	.90	1.3	1.1
5	.....	1.8	2.45	1.45	1.2	1.0	1.4	1.1
6	.....	1.95	2.45	1.4	1.15	1.05	1.3	1.1
7	.....	2.15	2.45	1.35	1.15	1.1	1.2	1.1
8	.....	2.15	2.3	1.35	1.15	1.06	1.2	1.15
9	.....	2.1	2.3	1.35	1.1	1.1	1.2	1.1
10	.....	2.3	2.35	1.4	1.15	1.1	1.2	1.1
11	.....	2.35	2.4	1.45	1.1	1.0	1.15	1.1
12	.....	2.4	2.25	1.35	1.1	1.0	1.2	1.05
13	.....	2.45	2.15	1.3	1.1	1.0	1.2	1.1
14	.....	2.3	2.05	1.3	1.1	1.0	1.2	1.1
15	.....	2.15	2.0	1.35	.....	1.05	1.15	1.05
16	.....	2.15	2.0	1.3	.....	1.0	1.15	1.0
17	.....	2.15	2.0	1.35	.....	1.0	1.2	1.1
18	.....	2.25	2.0	1.5	.....	1.0	1.15	1.05
19	.....	2.3	2.1	1.55	.....	1.0	1.1	1.1
20	.....	2.2	2.0	1.4	.....	1.0	1.15	1.05
21	1.65	2.1	2.0	1.4	.....	1.0	1.1	1.05
22	1.6	2.1	1.95	1.3	.....	1.15	1.05	1.05
23	1.4	2.25	1.85	1.5	1.0	1.2	1.1	1.1
24	1.35	2.4	1.75	1.7	1.0	1.15	1.15	1.15
25	1.4	2.5	1.9	1.55	1.0	1.2	1.1	1.1
26	1.4	2.6	1.9	1.4	1.0	1.2	1.1	1.1
27	1.4	2.75	1.8	1.4	.95	1.2	1.2	1.1
28	1.5	2.75	1.75	1.35	1.0	1.15	1.1	1.15
29	1.7	2.75	1.8	1.3	1.0	1.15	1.1	1.1
30	1.95	2.85	1.65	1.25	1.0	1.15	1.15	1.05
31	.....	2.9	.....	1.3	1.0	.....	1.15	.....

NOTE.—Gage heights from automatic gage, except those for Sept. 12 to 23, inclusive, which represent rod-gage readings.

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Daily discharge, in second-feet, of Laramie River near Jelm, Wyo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	356	836	194	102	42	67	
2	.....	334	734	168	90	35	67	
3	.....	289	668	161	77	28	67	
4	.....	250	668	161	77	28	102	
5	.....	289	606	146	77	42	130	
6	.....	334	606	130	67	50	102	
7	.....	434	606	116	67	57	77	
8	.....	434	516	116	67	50	77	
9	.....	406	516	116	57	57	77	
10	.....	516	546	130	67	57	77	
11	.....	546	576	146	57	42	67	
12	.....	576	488	116	57	42	77	
13	.....	606	434	102	57	42	77	
14	.....	516	381	102	57	42	77	
15	.....	434	356	116	57	50	67	
16	.....	434	356	102	57	42	67	
17	.....	434	356	116	42	42	77	
18	.....	488	356	161	42	42	67	
19	.....	516	406	178	42	42	57	
20	.....	461	356	130	42	42	67	
21	212	406	356	130	42	42	57	
22	194	406	334	102	42	67	50	
23	130	488	290	161	42	77	57	
24	116	576	250	230	42	67	67	
25	130	636	311	178	42	77	57	
26	130	701	311	130	42	77	57	
27	130	801	289	130	35	77	77	
28	161	801	250	116	42	67	57	
29	230	801	269	102	42	67	57	
30	334	871	212	90	42	67	67	
31	.....	906	.....	102	42	.....	67	.....

Monthly discharge of Laramie River near Jelm, Wyo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
April 21–30	334	116	177	3,5[illegible]
May	906	250	516	31,7[illegible]
June	836	212	441	26,2[illegible]
July	230	90	135	8,3[illegible]
August	102	35	55.3	3,4[illegible]
September	77	28	52.0	3,0[illegible]
October	130	50	71.4	4,3[illegible]
November	67	42	55.9	3,3[illegible]
The period	.....	.....	.....	83,9[illegible]

BIRDWOOD CREEK NEAR SUTHERLAND, NEBR.

Location.—At highway bridge in sec. 2, T. 15 N., R. 33 W., 16 miles north of Sutherland. Nearest tributary, West Birdwood Creek, enters 2 miles below.

Records available.—August 26 to December 31, 1913.

Drainage area.—Not measured.

Gage.—Vertical staff; gage was moved upstream September 1, 1913.

Control.—Somewhat shifting.

Discharge measurements.—Made from pile bent bridge.

Winter flow.—No data.

Diversions.—Prior to September 1, 1912, there were approved diversions of 117 second-feet from Birdwood Creek below station; none above station.

Accuracy.—Flow very uniform as creek is fed by springs; measurements during period sufficient to insure very good results.

Cooperation.—Field data furnished by State engineer.

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Discharge measurements of Birdwood Creek near Sutherland, Nebr., in 1913.

[Hydrographer, C. J. McNamara.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Aug. 26	1.30	135	Oct. 19	3.05	172
31	1.00	174	Nov. 2	3.06	172
Sept. 13	3.00	171	Dec. 12	3.00	174
26	3.05	172			

Daily gage height, in feet, and discharge, in second-feet, of Birdwood Creek near Sutherland, Nebr., for 1913.

[C. J. McNamara, observer.]

Day.	September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	3.0	170	3.05	172	3.05	172	3.05	172
2	3.0	170	3.05	172	3.06	172	3.05	172
3	3.0	170	3.05	172	3.05	172	3.05	172
4	3.0	170	3.05	172	3.05	172	3.05	172
5	3.0	170	3.05	172	3.05	172	3.05	172
6	3.0	170	3.05	172	3.05	172	3.05	172
7	3.0	170	3.05	172	3.05	172	3.05	172
8	3.0	170	3.05	172	3.05	172	3.05	172
9	3.0	170	3.05	172	3.05	172	3.05	172
10	3.05	173	3.05	172	3.05	172	3.05	172
11	3.0	170	3.05	172	3.05	172	3.0	174
12	3.0	170	3.05	172	3.05	172	3.0	174
13	3.0	170	3.05	172	3.05	172	3.0	174
14	3.0	170	3.05	172	3.05	172	3.05	185
15	3.0	170	3.05	172	3.05	172	3.05	185
16	3.12	177	3.05	172	3.05	172	3.05	185
17	3.1	176	3.05	172	3.05	172	3.05	185
18	3.05	173	3.05	172	3.05	172	3.05	185
19	3.0	170	3.05	172	3.05	172	3.08	192
20	3.0	170	3.05	172	3.05	172	3.08	192
21	3.0	170	3.05	172	3.05	172	3.08	192
22	3.0	170	3.05	172	3.05	172	3.08	192
23	3.12	177	3.05	172	3.05	172	3.12	200
24	3.10	176	3.05	172	3.05	172	3.12	200
25	3.05	173	3.05	172	3.05	172	3.12	200
26	3.0	170	3.05	172	3.05	172	3.12	200
27	3.0	170	3.05	172	3.05	172	3.12	200
28	3.05	173	3.05	172	3.05	172	3.05	185
29	3.05	173	3.05	172	3.05	172	3.05	185
30	3.05	173	3.05	172	3.05	172	3.05	185
31	.....	.....	3.05	172	.....	.....	3.05	185

Monthly discharge of Birdwood Creek near Sutherland, Nebr., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
September	177	170	171	10,200	A.
October	172	172	172	10,600	A.
November	172	172	172	10,200	A.
December	200	172	183	11,300	A.

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SOUTH FORK OF SOUTH PLATTE RIVER AT LAKE GEORGE, COLO.

Location.—At highway bridge in sec. 19, T. 12 S., R. 71 W., one-fourth mile below Lake George, in Pike national forest, about 2 miles above mouth of Caylor Gulch; no tributary between outlet of lake and the station.

Records available.—October 22, 1910, to December 31, 1913.

Drainage area.—Not measured.

Gage.—Automatic recording gage installed in 1911, reading to the same datum as the original staff gage.

Control.—A 2-foot timber-crib dam 50 feet below the gage.

Discharge measurements.—Made from bridge during high water and by wading at ordinary stages.

Winter flow.—Ice causes backwater during the winter months and measurements are made to determine the flow.

Regulation.—The discharge at the station is controlled naturally to some extent by the dam at the outlet of Lake George. The lake has an area of one-half square mile and is used as an ice pond. It is controlled to a greater extent by Antero reservoir, located 45 miles upstream.

Diversions.—There are court decrees for diversions of 1,076 second-feet from the South Fork above Lake George. Besides these, Antero reservoir has a decree for storage of 85,600 acre-feet from the South Fork and tributaries. The Antero water all passes the Lake George station, as it is finally diverted from the South Platte. There are decrees for diversions of 1,926 second-feet from tributaries above Lake George.

Accuracy.—Conditions favorable for accurate results; estimates considered reliable.

Cooperation.—Station maintained in cooperation with United States Forest Service and the State engineer.

Discharge measurements of South Fork of South Platte River at Lake George, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
May 16	M. E. Bunger	1.65	37.6	June 4	R. H. Fletcher	1.92	86
June 3	R. H. Fletcher	2.06	122	Nov. 5	.....do	1.68	48
4	.....do	1.92	85				

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Daily gage height, in feet, of South Fork of South Platte River at Lake George, Colo., for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.80	2.05	2.6	2.45	.....	.....	1.4
2	.....	2.00	2.0	2.55	2.45	2.1	.....	1.4
3	.....	1.97	1.8	2.5	2.45	.....	1.6	1.4
4	.....	1.84	1.8	2.5	2.45	2.1	1.7	.....
5	.....	1.85	1.85	2.5	2.4	.....	1.7	1.4
6	.....	1.85	1.9	2.5	2.4	1.95	1.4	.....
7	.....	1.80	1.9	2.4	2.4	.....	.....	1.4
8	.....	1.90	1.85	2.25	2.55	.....	1.4	1.4
9	.....	2.15	1.85	2.2	2.7	1.8	1.45	.....
10	.....	2.25	1.95	2.2	2.8	1.8	.....	1.4
11	.....	2.35	2.0	2.2	2.7	1.8	.....	.....
12	.....	2.55	2.05	2.4	2.7	1.8	1.6	1.4
13	.....	2.60	2.0	.....	2.6	1.7	1.7	1.4
14	.....	2.05	1.9	2.65	2.6	1.75	1.7	1.4
15	.....	1.85	1.75	2.45	2.65	1.75	.....	.....
16	.....	1.85	1.7	2.35	2.65	1.75	1.5	1.4
17	.....	1.90	1.9	2.4	2.65	.....	1.4	1.4
18	.....	1.85	2.55	2.4	2.5	1.6	.....	1.4
19	.....	2.35	2.35	2.4	2.55	1.6	.....	.....
20	.....	2.55	2.55	2.45	2.6	1.65	1.6	1.4
21	.....	2.45	2.6	2.55	2.4	.....	.....	1.4
22	.....	2.42	2.7	2.6	2.2	1.65	.....	.....
23	.....	2.38	2.9	2.7	2.2	.....	.....	.....
24	1.20	2.38	3.2	2.6	2.1	.....	.....	.....
25	1.27	2.32	3.0	2.65	2.0	.....	.....	.....
26	1.30	2.30	2.85	2.6	.....	.....	1.4	.....
27	1.30	2.28	2.8	2.55	.....	1.4	1.4	.....
28	1.38	2.20	2.8	2.55	2.00	1.4	.....	.....
29	1.50	2.0	2.8	.....	.....	1.4	.....	.....
30	1.66	2.1	2.7	2.65	2.20	1.5	1.4	.....
31	1.70	.....	2.6	2.5	.....	1.8	.....	.....

NOTE.—Gage heights prior to Sept. 25 taken chiefly from automatic gage; after that date from staff gage.

Daily discharge, in second-feet, of South Fork of South Platte River at Lake George, Colo., for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	65	114	315	248	140	57	26
2	.....	103	103	292	248	126	49	26
3	.....	97	65	270	248	126	41	26
4	.....	72	65	270	248	126	52	26
5	.....	74	74	270	227	111	52	26
6	.....	74	83	270	227	93	26	26
7	.....	65	83	227	227	83	26	26
8	.....	83	74	171	292	74	26	26
9	.....	140	74	154	365	65	30	26
10	.....	171	93	154	415	65	33	26
11	.....	208	103	154	365	65	37	26
12	.....	292	114	227	365	65	41	26
13	.....	315	103	279	315	52	52	26
14	.....	114	83	340	315	58	52	26
15	.....	74	58	248	340	58	43	26
16	.....	74	52	208	340	58	33	26
17	.....	83	83	227	340	50	26	26
18	.....	74	292	227	270	41	31	26
19	.....	208	208	227	292	41	36	26
20	.....	292	292	248	315	46	41	26
21	.....	248	315	292	227	46	38	26
22	.....	236	365	315	154	46	35	26
23	.....	219	470	365	154	41	32	26
24	15	219	645	315	126	37	29	26
25	18	196	525	340	103	33	26	26
26	20	188	442	315	103	29	26	26
27	20	181	415	292	103	26	26	26
28	25	154	415	292	103	26	26	26
29	33	103	415	315	126	26	26	26
30	48	126	365	340	154	33	26	26
31	52	.....	315	270	.....	65	.....	26

NOTE.—Discharge determined from a well-defined rating curve. Discharge estimated for days for which gage heights are missing.

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Monthly discharge of South Fork of South Platte River at Lake George, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May 24-31	52	15	28.9	459	B.
June	315	65	152	9,040	B.
July	645	52	223	13,700	B.
August	365	154	265	16,300	B.
September	415	103	245	14,600	B.
October	140	26	62.9	3,870	B.
November	57	26	35.8	2,130	B.
December	26	26	26.0	1,600	C.
The period				61,700	

SOUTH PLATTE RIVER AT SOUTH PLATTE, COLO.

Location.—In sec. 25, T. 7 S., R. 70 W., in Pike National Forest, three-quarters of a mile east of South Platte, about 300 feet below junction of North and South forks. No tributary enters between forks and station or for several miles below.

Records available.—March 28, 1902, to December 31, 1913. Records at Platte Canyon and at Deansbury, a few miles below, extend back to 1887, with the exception of the years 1893 and 1894. The earlier records, 1887–1892, were taken by the State engineer, and records from 1895 to 1898 were taken under direction of the Denver Power & Irrigation Co.

Drainage area.—2,610 square miles (measured from Hayden atlas).

Gage.—An automatic recording gage installed by the State engineer March 14, 1910. From March 28, 1902, to May 7, 1905, the gage was at the highway bridge. On the latter date it was moved to its present site, 150 feet below. It is probable that the new gage read to a somewhat different datum. The recording gage is referred to datum of gage established in 1905.

Control.—Practically permanent during 1913.

Discharge measurements.—Made from car and cable during high water and by wading at low stages.

Winter flow.—Ice causes backwater during a portion of the winter months and measurements are made to determine the flow.

Regulation.—The flow is controlled to a certain extent by the Cheesman reservoir, which is situated on the South Fork about 20 miles above forks and has a capacity of approximately 80,000 acre-feet.

Diversions.—No water is diverted between this station and that on the North Fork at South Platte. Between the station on the South Fork near Lake George and South Platte the Cheesman reservoir has a court decree for 80,000 acre-feet for municipal purposes. This water all passes the gaging station, as it is diverted from the South Platte farther downstream. There are decrees for diversions of 1,400 second-feet from intervening tributaries and a reservoir decree for 46,000 acre-feet.

Accuracy.—Conditions are favorable for accurate results and the estimates are considered reliable.

Cooperation.—Station maintained in cooperation with the State engineer.

Discharge measurements of South Platte River at South Platte, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 1	R. H. Fletcher	2.00	180	Sept. 29	Robert Follansbee	2.46	351
May 15	Raymond Richards	2.84	540	Dec. 5	R. H. Fletcher	2.92	383
June 16	R. H. Fletcher	3.57	825	29	do	2.2	139
Aug. 8	do	2.68	454				

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Daily gage height, in feet, of South Platte River at South Platte, Colo., for 1913.

[Miss A. Vermillion, observer.]

Day.	Jan.	Feb.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	2.00	3.10	3.10	3.3	2.9	2.6	2.65	2.15	1.78
2	.....	.....	2.05	3.15	3.35	3.4	2.9	2.65	2.8	2.1	1.9
3	.....	.....	1.90	3.00	3.20	3.6	2.85	2.65	2.95	2.25	1.82
4	.....	.....	1.70	2.85	3.20	3.5	2.8	2.65	2.9	2.35	1.66
5	.....	.....	1.80	2.75	3.10	3.4	2.8	2.7	2.7	2.2	2.4
6	.....	.....	1.85	2.95	3.30	3.4	2.9	2.65	2.55	2.15	2.7
7	.....	.....	1.85	3.10	3.70	3.3	.....	2.55	2.55	2.15	2.55
8	.....	.....	1.80	2.95	3.80	3.2	2.75	2.65	2.5	2.05	2.35
9	.....	.....	1.65	2.90	3.90	3.2	2.65	2.65	2.45	2.05	2.25
10	.....	.....	1.60	2.95	3.80	3.2	2.85	2.7	2.4	2.0	.....
11	.....	.....	1.70	3.05	4.00	3.2	2.9	3.0	2.35	2.05	.....
12	.....	.....	1.75	3.10	4.00	3.3	2.9	3.15	2.35	2.05	.....
13	4.50	.....	1.90	3.20	4.10	2.8	2.85	3.0	3.65	2.1	.....
14	.....	.....	2.25	3.00	4.00	2.7	2.8	2.95	2.3	2.15	.....
15	.....	.....	3.10	2.80	3.70	2.7	2.8	3.0	2.1	2.05	1.9
16	.....	.....	3.30	2.80	3.55	2.7	2.85	3.0	2.1	1.95	1.94
17	.....	.....	3.35	2.85	.....	2.95	3.4	2.9	2.15	2.0	1.73
18	.....	.....	3.15	2.90	.....	3.1	2.9	2.75	2.05	2.0	1.81
19	.....	.....	3.05	2.95	.....	3.5	3.4	2.6	2.05	2.1	1.85
20	.....	.....	3.10	2.85	.....	3.6	3.3	2.35	2.05	2.15	1.94
21	.....	.....	3.40	2.75	3.40	3.8	2.25	2.3	2.1	2.25	.....
22	.....	.....	3.20	2.70	.....	3.7	3.3	2.3	2.1	2.05	2.0
23	.....	.....	3.10	2.85	4.15	3.9	3.6	2.25	2.1	1.85	1.82
24	.....	.....	2.80	2.95	4.1	4.2	3.0	2.25	2.2	1.75	1.80
25	.....	4.3	2.80	2.85	3.95	4.3	2.95	2.25	2.25	1.95	.....
26	.....	.....	2.75	3.05	3.95	4.3	2.9	2.25	2.15	1.92	.....
27	.....	.....	2.75	3.10	3.95	4.2	2.85	2.25	2.1	1.95	.....
28	.....	.....	2.85	2.95	3.85	3.8	2.75	2.3	2.1	2.0	.....
29	.....	.....	2.95	3.10	3.7	3.1	2.6	2.45	1.95	2.1	.....
30	.....	.....	3.05	3.10	3.4	3.0	2.55	2.45	2.05	1.82	3.4
31	.....	.....	.....	3.10	.....	2.95	2.55	.....	2.15	.....	2.9

NOTE.—Ice present Jan. 1 to Mar. 31 and Dec. 5 to 31.

Daily discharge, in second-feet, of South Platte River at South Platte, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	190	633	633	719	547	421	442	241	135
2	206	654	741	762	547	442	505	223	164
3	164	590	676	848	526	442	569	280	145
4	117	526	676	805	505	442	547	319	108
5	140	484	633	762	505	463	463	260	339
6	152	569	719	762	547	442	400	241	395
7	152	633	891	719	510	400	400	241	354
8	140	569	934	676	484	442	380	206	314
9	106	547	977	676	442	442	359	206	276
10	95	569	934	676	526	463	339	190	250
11	117	612	1,020	676	547	590	319	206	160
12	129	633	1,020	719	547	655	319	206	160
13	164	676	1,060	505	526	590	870	223	220
14	280	590	1,020	463	505	569	299	241	145
15	633	505	891	463	505	590	223	206	117
16	719	505	827	463	526	590	223	177	117
17	741	526	1,100	569	762	547	241	190	124
18	655	547	1,280	633	547	484	206	190	128
19	612	569	1,450	805	762	421	206	223	117
20	633	526	1,580	848	719	319	206	241	95
21	762	484	762	934	280	299	223	280	95
22	676	463	921	891	719	299	223	206	95
23	633	526	1,080	977	848	280	223	152	140
24	505	569	1,060	1,110	590	280	260	129	140
25	505	526	999	1,150	569	280	280	177	140
26	484	612	999	1,150	547	280	241	169	152
27	484	633	999	1,110	526	280	223	177	152
28	526	569	956	934	484	299	223	190	117
29	569	633	891	633	421	359	177	223	140
30	612	633	762	590	400	359	206	145	140
31	.....	633	.....	569	400	.....	241	.....	140

NOTE.—Discharge computed from a rating curve well defined throughout. Discharge estimated for days for which gage heights are missing by comparison with records of Denver Union Water Co. at Platte Canyon. Discharge during December estimated from measurements, temperature records, and comparison with records of Denver Union Water Co.

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Monthly discharge of South Platte River at South Platte, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
January	.....	.....	108	6,640	C.
February	.....	.....	83	4,610	C.
March	.....	.....	90	5,530	C.
April	762	95	397	23,600	A.
May	676	463	572	35,200	A.
June	1,450	633	943	56,100	A.
July	1,150	463	761	46,800	A.
August	848	280	544	33,400	A.
September	655	280	426	25,300	A.
October	870	177	324	19,900	A.
November	319	129	212	12,600	A.
December	395	95	171	10,500	C.
The year	1,450	.....	387	280,000	

NOTE.—Monthly means for January, February, and March based on records of the Denver Union Water Co. at Platte Canyon, decreased 1.4 per cent on account of the difference in drainage area.

SOUTH PLATTE RIVER AT DENVER, COLO.

Location.—At the Sixteenth Street viaduct in Denver, 500 feet below mouth of Cherry Creek.

Records available.—May 7, 1895, to November 30, 1913.

Drainage area.—3,840 square miles.

Gage.—Automatic recording gage installed August 12, 1909, and moved 100 feet upstream in April, 1913. The original gage was located at the Twenty-third Street viaduct. In July, 1895, a new gage was installed at the Fifteenth Street bridge. In August, 1898, an inclined staff gage was placed on the opposite side of the river, but referred to the same datum. This gage was destroyed by high water in June, 1900, and for remainder of the year the gage installed in July, 1895, was used. This gage was stolen and a new one placed between the Fifteenth and Sixteenth Avenue bridges May 15, 1901, reading to same datum. This gage also was stolen and was replaced on June 10, 1903, by a vertical staff near the same place, and having the same datum. The automatic gage is referred to practically the same datum as the preceding vertical staff.

Control.—Shifting.

Discharge measurements.—Made from the Fifteenth Street bridge during high water and by wading at low-water stages.

Winter flow.—Seldom affected by ice.

Diversions.—Between this station and the one at South Platte there are court decrees for diversions from South Platte River of 2,226 second-feet and from intervening tributaries of 1,466 second-feet.

Cooperation.—Records since 1907 furnished by State engineer; considered only approximate for 1913.

Discharge measurements of South Platte River at Denver, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 21	Bunger and Hezmalhalch	.....	130	May 24	M. E. Bunger	2.75	170
Feb. 10	.....do	.....	138	July 2	Bunger and Hezmalhalch	2.90	319
Apr. 22	Bunger and Bundy	4.60	1,185	25	.....do	4.60	1,303
29	.....do	4.20	814	Oct. 2	D. L. Bundy	3.20	235
May 5	Bunger and Chrisman	3.90	669	Nov. 11	Thos. Grieve, jr	2.78	233
23	M. E. Bunger	2.82	187	12	M. E. Bunger	2.70	230

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Daily gage height, in feet, of South Platte River at Denver, Colo., for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	4.4	3.55	3.25	2.6	3.15	.....	.....	.....
2	4.4	3.85	2.95	2.5	2.95	3.15	3.2	.....
3	4.35	3.5	3.10	3.0	3.2	.....	.....	.....
4	4.2	3.35	3.15	3.0	3.3	.....	.....	.....
5	3.9	3.3	3.20	3.0	3.1	3.35	2.95	.....
6	3.85	3.25	3.10	2.75	3.05	.....	3.0	3.0
7	3.85	4.1	2.95	2.75	3.05	.....	.....	3.0
8	3.7	4.15	2.80	2.8	3.2	3.1	.....	.....
9	3.7	4.0	2.90	2.7	3.2	.....	3.1	2.9
10	3.7	4.1	2.90	3.05	3.25	3.2	.....	.....
11	3.7	4.0	2.7	3.4	3.25	.....	2.75	.....
12	3.5	4.15	2.7	3.3	3.55	3.45	2.7	2.7
13	3.5	4.5	2.7	3.15	3.35	3.3	2.6	.....
14	3.6	4.15	2.7	3.0	3.0	.....	.....	2.7
15	3.5	3.6	2.7	2.9	2.95	2.7	.....	.....
16	3.3	3.7	3.1	2.85	3.0	2.65	2.6	.....
17	3.15	3.7	3.1	2.75	2.9	.....	.....	.....
18	3.1	4.45	3.8	3.65	2.8	.....	.....	.....
19	3.25	4.65	4.4	3.2	2.7	2.7	.....	.....
20	3.2	4.6	3.5	2.8	2.7	.....	2.5	.....
21	3.1	4.95	3.6	2.85	2.6	.....	.....	2.5
22	3.0	4.0	3.5	3.6	2.4	2.75	.....	.....
23	2.65	3.9	3.8	3.25	.....	.....	2.5	.....
24	2.75	4.0	3.7	3.25	3.2	2.55	.....	.....
25	2.85	3.9	4.7	3.2	3.0	.....	2.5	.....
26	2.7	3.6	4.2	3.3	2.5	2.8	.....	.....
27	2.8	3.4	3.5	3.25	2.4	.....	2.45	.....
28	3.1	3.4	3.5	3.2	2.4	.....	.....	2.7
29	3.4	3.35	3.2	3.15	2.4	3.2	.....	.....
30	3.5	3.3	3.0	3.35	2.3	3.0	2.4	.....
31	3.6	.....	2.6	3.1	.....	2.95	.....	.....

Daily discharge, in second-feet, of South Platte River at Denver, Colo., for 1913.

Day.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	995	462	337	137	296	.....	.....	.....
2	995	621	226	116	226	269	360	.....
3	958	438	278	242	316	.....	.....	.....
4	845	371	296	242	358	.....	.....	.....
5	650	350	316	242	278	341	280	.....
6	621	331	278	170	260	.....	300	310
7	621	775	226	170	260	.....	.....	310
8	538	810	182	182	316	253	.....	.....
9	538	710	210	158	316	.....	350	275
10	538	775	210	260	337	285	.....	.....
11	538	710	158	404	337	.....	230	.....
12	438	810	158	358	482	381	215	215
13	438	1,075	158	296	381	330	190	.....
14	486	810	158	242	242	.....	.....	215
15	438	486	158	210	226	160	.....	.....
16	350	538	278	196	242	145	190	.....
17	294	538	278	170	210	.....	.....	.....
18	276	1,035	635	540	182	.....	.....	.....
19	331	1,202	1,115	316	158	170	.....	.....
20	312	1,160	455	182	158	.....	170	.....
21	276	1,675	510	196	137	.....	.....	170
22	242	780	455	510	98	190	.....	.....
23	148	705	635	337	192	.....	170	.....
24	170	780	570	337	285	150	.....	.....
25	196	705	1,405	316	225	.....	170	.....
26	158	510	940	358	113	210	.....	.....
27	182	404	455	337	95	.....	155	.....
28	276	404	455	316	95	.....	.....	215
29	392	381	316	296	95	345	.....	.....
30	438	358	242	381	80	280	145	.....
31	486	.....	510	278	.....	255	.....	.....

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Monthly discharge of South Platte River at Denver, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
May	995	148	457	28,100
June	1,680	331	690	41,100
July	1,400	158	407	25,000
August	540	116	274	16,800
September	482	80	233	13,900
October (15 days)	381	145	251	7,470
November (13 days)	360	145	225	5,800
December (7 days)	310	170	244	3,390

SOUTH PLATTE RIVER NEAR KERSEY, COLO.

Location.—At highway bridge in sec. 9, T. 5 N., R. 64 W., 1¾ miles north of Kersey, 2 miles below entrance of Lone Tree Creek, an intermittent stream, and 3 miles below mouth of Cache la Poudre River.

Records available.—April 27, 1901, to October 31, 1903; March 1, 1905, to November 30, 1913.

Drainage area.—9,500 square miles.

Gage.—A chain gage placed in the fall of 1906 in each of the two channels in which the river flows. These gages were referred to a datum slightly different from that of the original gage, but have remained permanent since. The original gage, a vertical staff, was used until June 14, 1906, when the observer moved it 20 feet south. This gage was placed 0.30 foot too high and all readings were corrected by that amount until the chain gages were placed in position.

Control.—Shifting.

Discharge measurements.—Made from the bridge during high water and by wading at ordinary stages.

Winter flow.—Ice causes slight backwater for a few days during the winter.

Diversions.—Between this station and Denver there are court decrees for diversions of 3,764 second-feet from the South Platte and 17,000 second-feet from intervening tributaries, besides numerous flood-water decrees.

Accuracy.—Measurements during 1913 inadequate for estimates of discharge; only base data available.

Cooperation.—Records furnished by State engineer.

Discharge measurements of South Platte River near Kersey, Colo., in 1913.

Date.	Hydrographer.	Gage No. 1.		Gage No. 2.	
		Gage height.	Discharge.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*	*Feet.*	*Sec.-ft.*
Mar. 20	M. E. Bunger	3.20	378	3.30	422
May 3	.....do	3.85	476	4.00	862
June 20	.....do	2.35	58	2.05	57
Nov. 15	Grieve and Hezmalhalch	3.10	275	3.20	288
19	Bunger and Chrisman	3.00	258	3.15	278

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Daily gage height, in feet, of South Platte River near Kersey, Colo., for 1913.

[Mrs. J. C. Maisner, observer.]

Gage No. 1.

Day.	Jan.	Feb.	Mar.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	3.25	3.55	3.4	3.3	2.4	2.3	2.3	3.4	3.2
2	3.2	3.42	.....	3.3	2.4	2.25	2.3	3.4	3.3
3	3.22	3.38	.....	2.7	2.4	2.35	2.4	3.6	3.3
4	3.25	3.38	.....	2.35	2.4	2.4	2.4	3.75	3.3
5	3.2	3.3	.....	2.35	2.35	2.3	2.4	3.8	3.4
6	4.52	3.3	.....	2.3	2.3	2.2	2.4	3.8	3.4
7	4.35	3.28	.....	2.9	2.25	2.25	2.4	3.7	3.4
8	4.55	3.32	.....	2.6	2.25	2.25	2.4	3.5	3.3
9	4.5	5.45	.....	2.5	2.25	2.25	2.55	3.45	3.3
10	4.5	4.48	.....	2.5	2.25	2.25	2.55	3.3	3.2
11	4.5	3.35	.....	2.5	2.25	2.25	2.6	3.3	3.2
12	4.5	3.28	.....	2.4	2.2	2.3	2.55	3.3	3.2
13	4.48	3.32	.....	2.35	2.2	2.3	2.6	3.3	3.2
14	4.35	3.32	.....	2.45	2.25	2.35	2.9	3.3	3.2
15	4.32	.....	.....	2.35	2.25	2.3	2.8	3.3	3.2
16	3.75	3.4	.....	2.4	2.25	2.3	3.05	3.4	3.2
17	3.55	3.48	.....	2.3	2.25	2.4	3.3	3.3	3.15
18	3.55	3.5	.....	2.3	2.3	2.3	3.5	3.2	3.1
19	3.6	3.5	.....	2.35	2.3	2.3	3.4	3.2	3.15
20	3.5	3.42	.....	2.5	3.0	2.35	3.3	3.15	3.15
21	3.45	3.4	.....	2.7	3.0	2.35	3.25	3.1	3.15
22	3.4	3.3	.....	3.2	2.5	2.5	3.2	3.1	3.1
23	3.48	3.3	.....	2.9	2.4	2.4	3.2	3.5	3.1
24	3.5	3.28	.....	2.65	3.1	2.4	3.2	3.1	3.1
25	3.5	3.3	.....	2.5	3.5	2.4	3.3	3.3	3.1
26	3.52	3.42	.....	2.4	3.65	2.4	3.6	3.3	3.1
27	3.5	3.48	.....	2.3	3.5	2.35	3.5	3.1	3.15
28	3.52	3.42	.....	2.3	3.4	2.3	3.5	3.1	3.15
29	3.5	.....	.....	2.3	2.85	2.25	3.45	3.2	3.15
30	3.5	.....	.....	2.35	2.6	2.25	3.4	3.2	.....
31	3.6	.....	.....	.....	2.45	2.3	.....	3.2	.....

NOTE.—Channel No. 1—River frozen over Jan. 6 to Jan. 16, Feb. 9 and 10.

Gage No. 2.

Day.	Jan.	Feb.	Mar.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	3.32	3.5	3.4	3.5	2.1	2.2	2.1	3.4	3.25
2	3.32	3.42	.....	3.5	2.1	2.3	2.2	3.4	3.3
3	3.3	3.32	.....	2.35	2.1	2.2	2.3	3.6	3.3
4	3.3	3.32	.....	2.0	2.15	2.2	2.3	3.7	3.35
5	3.3	3.3	.....	2.5	2.05	2.3	2.3	3.8	3.35
6	4.12	3.35	.....	2.0	2.0	2.25	2.3	3.8	3.4
7	4.5	3.3	.....	2.75	2.0	2.25	2.3	3.7	3.4
8	4.78	3.35	.....	2.3	2.0	2.0	2.3	3.5	3.3
9	4.68	5.35	.....	2.25	2.25	2.5	2.5	3.4	3.3
10	4.68	4.48	.....	2.3	2.25	2.5	2.55	3.3	3.2
11	4.68	3.4	.....	2.25	2.0	2.3	2.6	3.3	3.2
12	4.6	3.4	.....	2.15	2.0	2.1	2.5	3.2	3.2
13	4.6	3.38	.....	2.2	2.0	2.1	2.55	3.2	3.15
14	4.35	3.42	.....	2.15	2.0	2.15	2.85	3.15	3.1
15	4.38	.....	.....	2.1	2.5	2.1	2.85	3.2	3.1
16	3.82	3.5	.....	2.1	2.25	2.1	3.3	3.35	3.1
17	3.5	3.58	.....	2.0	2.5	2.2	3.25	3.3	3.3
18	3.6	3.6	.....	2.25	2.1	2.15	3.4	3.25	3.3
19	3.55	3.62	.....	2.3	2.15	2.2	3.35	3.3	3.3
20	3.55	3.55	.....	2.3	3.0	2.2	3.3	3.2	3.00
21	3.55	3.5	.....	2.55	3.1	2.2	3.25	3.2	3.5
22	3.5	3.45	.....	3.05	2.3	2.50	3.15	3.25	3.25
23	3.5	3.4	.....	2.6	2.3	2.35	3.1	3.2	3.25
24	3.6	3.3	.....	2.3	2.9	2.35	3.35	3.2	3.0
25	3.58	3.35	.....	2.2	3.4	2.3	3.3	3.2	3.0
26	3.6	3.4	.....	2.05	3.6	2.2	3.55	3.1	3.25
27	3.6	3.4	.....	2.0	3.4	2.2	3.5	3.1	3.5
28	3.55	3.4	.....	1.9	3.1	2.2	3.4	3.1	3.5
29	3.5	.....	.....	1.95	2.8	2.1	3.4	3.2	3.5
30	3.48	.....	.....	2.0	2.6	2.15	3.4	3.25	.....
31	3.5	.....	.....	.....	2.4	2.15	.....	3.25	.....

NOTE.—Channel No. 2—River frozen over Jan. 6 to 16; ice gorged, Feb. 9 and 10.

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SOUTH PLATTE RIVER AT JULESBURG, COLO.

Location.—At highway bridge 1 mile south of Julesburg, about sec. 33, T. 12 N., R. 44 W. No important tributaries between station and Colorado-Nebraska State line, 1 mile distant. All tributaries for 100 miles or more above station are intermittent.

Records available.—April 2, 1902, to November 16, 1906; May 12, 1908, to November 28, 1913.

Drainage area.—20,600 square miles.

Gage.—When station was reestablished in 1908 it was located at new highway bridge, 2,000 feet upstream from the original station. The datum of chain gage has remained unchanged since 1908.

Control.—Shifting; frequent measurements required.

Discharge measurements.—Made from pile bridge during high water and by wading at low-water stages.

Winter flow.—Ice causes backwater during winter months.

Diversions.—Between Kersey and Julesburg there are court decrees for diversions of 5,316 second-feet from the South Platte and diversions of 1,240 second-feet from intervening tributaries, including Lodgepole Creek in Nebraska and Wyoming, and Crow Creek in Wyoming. There are also numerous flood-water decrees. Between State line and the mouth diversions of 206 second-feet from the South Platte have been granted in Nebraska.

Accuracy.—Sufficient measurements were not secured during 1913 to allow estimates to be made, and only base data are available.

Cooperation.—Records for 1913 furnished by State engineer

Discharge measurements of South Platte River at Julesburg, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
July 24	Robert Follansbee	0.55	a 21
Nov. 19	Grieve and Hesmalhalch	.80	62

a Discharge estimated.

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Daily gage height, in feet, of South Platte River at Julesburg, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	2.6	0.65	0.75	0.55	0.55	0.6	.....
2	.....	2.5	.7	.6	.50	.6	.55	.....
3	.....	2.5	.65	.5	.50	.6	.55	0.75
4	.....	2.2	.65	.5	.50	.6	.....	.75
5	.....	2.0	.65	.5	.50	.55	.....	1.1
6	.....	1.7	.6	.5	.50	.55	.6	.9
7	.....	1.6	.6	.5	.6	.55	.5	.....
8	.....	1.6	.6	.45	.6	.55	.5	.85
9	.....	1.5	.6	.45	.5	.6	.55	.85
10	.....	1.4	.65	.5	.5	.....	.55	.....
11	.....	1.3	.65	.5	.6	.....	.....	.9
12	2.3	1.25	.7	.5	.6	.....	.55	.9
13	2.3	1.25	.7	.45	.55	.....	.55	.9
14	2.2	1.2	.7	.45	.55	.....	.5	.9
15	2.15	1.2	.7	.45	.5	.....	.5	.9
16	2.05	1.1	.6	.45	.5	.....	.55	.....
17	2.0	1.1	.55	.45	.5	.....	.6	.9
18	2.0	1.05	.55	.5	.5	.....	.6	.8
19	1.95	1.0	.55	.5	.5	.....	.....	.8
20	2.0	1.0	.6	.5	.55	.....	1.05	.8
21	1.9	.9	.65	.5	.55	.....	.6	.85
22	2.0	.9	.5	.5	.6	.....	.6	.85
23	2.1	.9	.5	.5	.65	.....	.6	.85
24	2.3	.8	.5	.55	.65	.....	.6	.85
25	2.5	.8	.4	.5	.6	.6	.....	.85
26	2.6	.8	.5	.5	.6	.65	.....	.85
27	2.6	.8	.5	.....	.6	.7	.6	.85
28	2.7	.8	.5	.6	.6	.7	.6	.90
29	2.65	.7	.8	.6	.55	.65	.6	.....
30	2.6	.65	.9	.6	.55	.6	.55	.....
31	.....	.65	.....	.6	.....	.....	.6	.....

NOTE.—Gage moved 100 feet south on July 24; referred to correct datum. Old gage found to read 0.03 feet high.

TARRYALL CREEK NEAR JEFFERSON, COLO.

Location.—At Robbins ranch, in sec. 6, T. 9 S., R. 74 W., about 10 miles southeast of Jefferson. Rock Creek enters half a mile below station.

Records available.—June 27, 1912, to December 4, 1913. From October 18, 1910, to June 28, 1911, a station was maintained within a quarter of a mile of this point, but the relation between the two gages is not known.

Drainage area.—Not measured.

Gage.—Vertical staff.

Control.—Practically permanent.

Discharge measurements.—Made by wading.

Winter flow.—Ice causes severe backwater during winter months; records discontinued.

Diversions.—There are court decrees for diversions of 314 second-feet from Tarryall Creek above the station and 220 second-feet below. The Tarryall Canal & Reservoir Co. has a provisional decree for storage of 68,000 acre-feet from Tarryall and tributaries above the station and a decree for a supply diversion amounting to 450 second-feet. This diversion has not yet been made. The Boreas ditch diverts a small amount of water from headwaters of Blue River to Tarryall Creek at its headwaters. There are decrees for diversions of 926 second-feet from tributaries entering above the station.

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Accuracy.—Owing to the high altitude of the drainage basin (9,500 to 13,000 feet), alternate melting and freezing cause considerable diurnal fluctuations during the high-water period, and the mean daily gage based on morning and evening readings, as well as the maximum stage for the 24 hours, maybe somewhat in error. For that reason the estimates can not be considered better than good. Rating curve excellent.

Cooperation.—Station maintained in cooperation with the Tarryall Canal & Reservoir Co.

Discharge measurements of Tarryall Creek near Jefferson, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Apr. 15	Robert Follansbee	0.92	120
24	R. H. Fletcher	.42	49
25	....do	.22	29
July 23	Robert Follansbee	.82	116

Daily gage height, in feet, of Tarryall Creek near Jefferson, Colo., for 1913.

[Rose Robbins, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	0.69	0.65	0.33	0.44	0.30	0.65	0.15	0.10
2	.....	.67	.58	.28	.36	.30	.75	.15	.10
3	1.05	.42	.73	.24	.34	.30	.45	.....	.08
4	.85	.36	.50	.16	.30	.30	.38	.15	.05
5	.75	.34	.53	−.02	.30	.30	.35	.20	.....
6	.69	.34	.52	−.02	.31	.30	.32	.20	.....
7	.49	.35	.65	−.14	.31	.45	.30	.30	.....
8	.35	.35	2.30	−.21	.30	.85	.26	.40	.....
9	.45	.30	2.20	−.13	.30	.95	.21	.45	.....
10	.45	.30	2.80	.28	.34	.75	.20	.38	.....
11	.35	.31	2.60	.23	.65	.65	.20	.35	.....
12	.37	.47	2.20	.00	.59	.71	.20	.32	.....
13	.65	.45	1.10	−.10	.45	.45	.20	.30	.....
14	1.30	.35	.90	−.12	.31	.45	.20	.25	.....
15	1.50	.20	.63	−.12	.30	.39	.20	.20	.....
16	1.00	.20	.59	−.14	.30	.34	.20	.20	.....
17	.85	.19	.60	1.45	.30	.30	.20	.20	.....
18	1.10	.20	.72	1.20	.30	.30	.20	.20	.....
19	.80	.20	1.10	1.35	.30	.30	.20	.20	.....
20	.69	.20	1.10	1.50	.51	.30	.20	.20	.....
21	.95	.20	1.10	1.35	.52	.30	.50	.20	.....
22	.80	.20	1.10	1.65	.48	.30	.48	.18	.....
23	.58	.08	1.10	1.00	.52	.30	.30	.15	.....
24	.40	.05	1.15	1.80	.66	.30	.28	.15	.....
25	.29	.05	.95	.80	.49	.30	.25	.12	.....
26	.31	.08	.75	.68	.35	.30	.20	.12	.....
27	.30	.62	.57	.38	.30	.30	.....	.....	.....
28	.54	.70	.50	.35	.30	.30	.20	.10	.....
29	.65	.46	.39	.35	.30	.30	.20	.10	.....
30	.58	.46	.28	.34	.30	.30	.....	.10	.....
31	.....	.52	.....	.30	.30	.....	.18	.....	.....

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Daily discharge, in second-feet, of Tarryall Creek near Jefferson, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	90	84	39	53	36	84	24	20
2	.....	86	73	34	43	36	99	24	20
3	146	50	95	31	40	36	54	24	19
4	114	43	61	24	36	36	45	24	17
5	99	40	64	13	36	36	42	27	.....
6	90	40	64	13	37	36	38	27	.....
7	60	42	84	7	37	54	36	36	.....
8	42	42	372	4	36	114	32	47	.....
9	54	36	353	8	36	130	28	54	.....
10	54	36	475	34	40	99	27	45	.....
11	42	37	433	30	84	84	27	42	.....
12	44	57	353	14	75	93	27	38	.....
13	84	54	155	9	54	54	27	36	.....
14	189	42	122	8	37	54	27	31	.....
15	225	27	80	8	36	46	27	27	.....
16	138	27	75	7	36	40	27	27	.....
17	114	26	76	216	36	36	27	27	.....
18	155	27	94	172	36	36	27	27	.....
19	106	27	155	198	36	36	27	27	.....
20	90	27	155	225	63	36	27	27	.....
21	130	27	155	198	64	36	61	27	.....
22	106	27	155	252	58	36	58	26	.....
23	73	19	155	138	64	36	36	24	.....
24	47	17	163	279	85	36	34	24	.....
25	35	17	130	106	60	36	31	21	.....
26	37	19	99	88	42	36	27	21	.....
27	36	79	71	45	36	36	27	20	.....
28	67	91	61	42	36	36	27	20	.....
29	84	55	46	42	36	36	27	20	.....
30	73	55	34	40	36	36	26	20	.....
31	.....	64	.....	36	36	.....	26	.....	.....

NOTE.—Discharge computed from a rating curve well defined below 315 second-feet but somewhat uncertain above that point. Impossible to measure considerable flow prior to Apr. 3 because of the severe effect of ice.

Monthly discharge of Tarryall Creek near Jefferson, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 3-30	225	35	90.5	5,030	B.
May	91	17	42.8	2,630	B.
June	475	34	150	8,930	B.
July	279	4	76.2	4,690	B.
August	85	36	46.4	2,850	B.
September	130	36	49.6	2,950	B.
October	99	26	36.6	2,250	B.
November	54	20	28.8	1,710	B.
The period	.....	.....	.....	31,000	

NORTH FORK OF SOUTH PLATTE RIVER AT GRANT, COLO.

Location.—At Grant post office, in sec. 9, T. 7 S., R. 74 W., in the Pike National Forest, 250 feet above the mouth of Geneva Creek.

Records available.—July 18, 1910, to December 31, 1913.

Drainage area.—51 square miles (measured from Forest atlas).

Gage.—Vertical staff whose datum has remained unchanged.

Control.—Permanent during 1913. No backwater from Geneva Creek.

Discharge measurements.—Made from footbridge and by wading.

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Winter flow.—Ice causes backwater during the winter months; measurements made to determine flow.

Diversions.—There are court decrees for diversions of 5.5 second-feet from the North Fork above the station and diversions of 24 second-feet from tributaries entering above.

Accuracy.—Owing to the high altitude of this station, considerable diurnal fluctuations at certain seasons of the year are likely to be caused by alternate melting and freezing, and the mean daily gage height based on one gage reading prior to October 1, 1913, may be considerably in error. This fact, together with the scattering gage heights, makes estimates at this station only fair during high-water period. Beginning October 1 the gage was read morning and evening and records for the last part of the year are good.

Cooperation.—Station maintained in cooperation with United States Forest Service and State engineer.

Discharge measurements of North Fork of South Platte River at Grant, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 15	Robert Follansbee.....	1.94	50	Sept. 28	Robert Follansbee.....	1.60	20
May 22	R. H. Fletcher.....	2.11	69	Dec. 4	R. H. Fletcher.....	a 1.94	8.96
June 17	.....do.....	2.24	85	30	.....do.....	a 1.82	5.83
Aug. 8	.....do.....	1.64	23				

a Discharge relation affected by ice.

Daily gage height, in feet, of North Fork of South Platte River at Grant, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	.....	.....	2.07	.....	1.57	1.72	1.60	1.86
2	.....	.....	.....	.....	1.77	1.62	1.89	1.60	1.94
3	.....	1.90	.....	.....	.....	.....	1.89	1.53	2.07
4	.....	.....	2.12	.....	1.67	.....	1.62	1.62	1.91
5	.....	1.85	2.12	.....	1.64	.....	1.65	1.70	2.07
6	.....	.....	.....	.....	.....	1.62	1.66	1.62	2.48
7	.....	.....	2.17	.....	.....	.....	1.59	1.53	2.41
8	.....	.....	2.17	1.82	.....	1.70	1.59	1.66	2.20
9	.....	.....	.....	1.87	1.64	1.70	1.62	1.60	2.07
10	.....	1.85	.....	1.87	.....	1.67	1.60	1.62	1.98
11	.....	.....	2.22	.....	1.72	.....	1.64	1.63	1.77
12	.....	.....	2.22	.....	1.72	1.67	1.60	1.56	1.74
13	.....	2.15	2.17	.....	.....	.....	1.71	1.56	1.77
14	.....	.....	.....	.....	1.64	.....	1.62	1.53	.....
15	1.95	.....	2.17	.....	.....	1.64	1.61	1.62	.....
16	.....	1.90	.....	1.92	.....	1.64	1.65	1.72	.....
17	.....	1.95	2.22	1.92	.....	.....	1.53	1.78	.....
18	1.60	.....	.....	.....	.....	1.62	1.62	1.52	.....
19	.....	2.00	.....	1.92	1.67	.....	1.62	1.53	.....
20	.....	.....	.....	.....	1.64	.....	1.59	1.56	.....
21	1.70	1.95	2.22	.....	1.64	1.59	1.59	1.54	.....
22	.....	2.05	.....	1.87	.....	1.59	1.67	1.62	.....
23	.....	2.10	2.12	.....	.....	1.57	1.59	1.76	.....
24	.....	.....	.....	1.87	.....	1.57	1.65	2.00	.....
25	1.70	.....	2.07	.....	1.62	.....	1.63	2.12	.....
26	1.60	.....	.....	1.87	.....	.....	1.77	2.12	.....
27	.....	.....	2.07	.....	.....	1.57	1.71	1.96	.....
28	1.70	.....	.....	1.82	1.62	1.61	1.57	1.92	.....
29	.....	2.22	.....	.....	1.57	.....	1.74	1.88	.....
30	1.90	.....	2.07	1.82	.....	.....	1.67	1.92	.....
31	.....	2.22	.....	.....	.....	.....	1.62	.....	.....

NOTE.—Ice present Nov. 22 to Dec. 31.

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Daily discharge, in second-feet, of North Fork of South Platte River at Grant, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	50	82	65	34	18	28	20	11
2	.....	45	79	60	32	21	44	20	11
3	.....	45	75	55	28	21	44	16	10
4	.....	42	72	50	24	21	21	21	9
5	.....	40	72	45	22	21	23	26	10
6	.....	35	75	40	22	21	24	21	11
7	.....	50	78	50	22	24	20	16	10
8	.....	60	78	37	22	26	20	24	9
9	.....	50	80	42	22	26	21	20	8
10	.....	40	82	42	25	24	20	21	7
11	.....	52	85	42	28	24	22	22	6
12	.....	64	85	43	28	24	20	18	6
13	.....	75	78	44	25	20	27	18	6
14	.....	65	78	45	22	19	21	16	5
15	51	55	78	46	22	22	21	21	5
16	40	45	82	47	23	22	23	28	5
17	30	51	85	47	23	22	17	33	6
18	20	54	90	47	24	21	21	16	6
19	23	57	95	47	24	21	21	16	6
20	24	54	90	46	22	20	20	18	6
21	26	51	85	44	22	20	20	17	6
22	26	63	85	42	22	20	24	16	6
23	26	69	72	42	22	18	20	16	6
24	26	65	68	42	21	18	23	16	6
25	26	60	65	42	21	18	22	14	6
26	20	80	65	42	21	18	32	13	6
27	23	75	65	40	21	18	27	13	6
28	26	70	65	37	21	20	18	12	6
29	36	85	65	37	18	22	30	12	6
30	45	85	65	37	18	25	24	11	6
31	.....	85	.....	36	18	.....	21	.....	6

NOTE.—Discharge computed from a rating curve well defined throughout. Discharge for days for which gage heights are missing estimated by comparison with flow of Geneva Creek. Discharge for ice periods computed from discharge measurements and temperature records.

Monthly discharge of North Fork of South Platte River at Grant, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 15-30	51	20	29.2	927	C.
May	85	35	58.6	3,600	C.
June	95	65	77.3	4,600	C.
July	65	36	44.5	2,740	C.
August	34	18	23.2	1,430	C.
September	26	18	21.2	1,260	C.
October	44	17	23.8	1,460	B.
November	28	11	18.4	1,090	B.
December	11	5	7.06	434	C.
The period	.....	.....	.....	17,500	

NORTH FORK OF SOUTH PLATTE RIVER AT CASSELLS, COLO.

Location.—At Cassells, in sec. 11, T. 7 S., R. 74 W., in Pike National Forest. The nearest tributary is a small stream entering from the south a short distance below.

Records available.—July 4, 1908, to November 30, 1913.

Drainage area.—128 square miles (measured from Forest atlas).

Gage.—Chain gage, which replaced a vertical staff reading to same datum. On May 23, 1913, the gage was moved 185 feet downstream and set to read the same as at the original site. Although the gage itself is below the headgates of the Cassell ditch in the present location, the measurements were all made above and, therefore, the flow represents that above the ditch, as the diversion is too small to have any appreciable effect on the gage heights.

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Control.—Permanent at new site.

Discharge measurements.—Made from bridge.

Winter flow.—Ice causes backwater during winter months.

Diversions.—There are no court decrees for diversions between this station and that at Grant, except for 2 second-feet from tributaries.

Accuracy.—Owing to the high altitude of this station, considerable diurnal fluctuations are likely to be caused at certain seasons of the year by alternate melting and freezing, and the mean daily gage height based on night and morning readings may be somewhat in error. For this reason the estimates can not be considered better than good. Rating curve excellent.

Cooperation.—Gage heights furnished by State engineer.

Discharge measurements of North Fork of South Platte River at Cassells, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 16	Robert Follansbee.....	1.40	69	Sept. 28	Robert Follansbee.....	1.19	74
May 24	R. H. Fletcher.....	2.01	242	Dec. 4	R. H. Fletcher.....	.92	27
June 17	.....do.....	2.10	285	31	.....do.....	1.20	29
Aug. 8	.....do.....	1.28	88				

Daily gage height, in feet, of North Fork of South Platte River at Cassells, Colo., for 1913.

[Miss Lulu Cassell, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	1.70	2.00	1.60	1.60	1.18	1.38	0.92
2	.....	1.55	1.90	1.60	1.55	1.26	1.26	.96
3	.....	1.55	1.90	1.55	1.42	1.21	1.26	1.00
4	.....	1.70	1.85	1.55	1.40	1.38	1.22	.98
5	.....	1.65	1.80	1.50	1.35	1.28	1.19	.98
6	.....	1.80	1.90	1.50	1.35	1.26	1.15	.99
7	.....	1.85	1.80	1.49	1.30	1.30	1.12	1.02
8	.....	1.80	2.05	1.55	1.22	1.50	1.10	1.04
9	.....	1.70	1.95	1.55	1.25	1.42	1.11	.98
10	.....	1.85	2.00	1.48	1.30	1.26	1.15	.90
11	.....	1.90	2.05	1.38	1.35	1.36	1.15	.98
12	.....	1.90	2.00	1.32	1.38	1.36	1.16	.98
13	.....	1.90	1.85	1.32	1.32	1.32	1.10	.95
14	.....	1.75	1.90	1.45	1.32	1.28	1.05	.95
15	.....	1.65	1.95	1.48	1.30	1.38	1.09	.82
16	1.50	1.70	1.95	1.80	1.28	1.32	1.08	.92
17	1.40	1.75	2.05	1.65	1.25	1.28	.99	.95
18	1.46	1.90	1.95	1.80	1.20	1.20	.98	.88
19	1.39	1.80	2.00	1.90	1.20	1.16	.98	.88
20	1.39	1.80	1.90	1.90	1.20	1.14	1.04	.85
21	1.45	1.80	1.95	1.80	1.20	1.18	1.08	.85
22	1.33	1.80	1.90	1.70	1.19	1.24	1.02	.88
23	1.40	1.90	1.85	1.70	1.16	1.20	1.05	.89
24	1.34	2.00	1.80	1.65	1.28	1.19	1.05	.72
25	1.29	1.95	1.80	1.60	1.19	1.21	1.08	.95
26	1.35	2.00	1.80	1.65	1.16	1.22	1.06	.85
27	1.39	2.00	1.70	1.65	1.19	1.23	.99	.88
28	1.55	1.95	1.80	1.60	1.20	1.17	.95	.94
29	1.65	2.00	1.80	1.60	1.18	1.14	.98	.70
30	1.75	2.00	1.70	.....	1.18	1.19	.92	.99
31	.....	2.00	.....	.....	1.16	.....	.88	.....

NOTE.—Gage heights May 23 to Nov. 30 refer to gage established on earlier date.

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Daily discharge, in second-feet, of North Fork of South Platte River at Cassells, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	115	243	139	139	73	100	47
2	.....	88	211	139	130	83	84	50
3	.....	88	211	130	106	76	84	54
4	.....	115	198	130	103	100	78	52
5	.....	105	184	120	96	85	74	52
6	.....	135	211	120	96	83	70	53
7	.....	148	184	118	88	88	66	56
8	.....	135	262	130	78	120	64	58
9	.....	115	227	130	82	106	65	52
10	.....	148	243	117	88	83	70	45
11	.....	160	262	100	96	97	70	52
12	.....	160	243	91	100	97	71	52
13	.....	160	198	91	91	87	64	50
14	.....	125	211	112	91	85	59	50
15	.....	105	227	117	88	100	63	39
16	80	115	227	184	85	91	62	47
17	67	125	262	150	82	85	53	50
18	75	160	227	184	75	75	52	43
19	66	135	243	211	75	71	52	43
20	66	135	211	211	75	68	58	41
21	74	135	227	184	75	73	62	41
22	59	135	211	160	74	80	56	29
23	67	211	198	160	71	75	59	37
24	60	243	184	150	85	74	59	31
25	54	227	184	139	74	76	62	50
26	61	243	184	150	71	78	60	41
27	66	243	160	150	74	79	53	43
28	88	227	184	139	75	72	50	40
29	105	243	184	139	73	68	52	30
30	125	243	160	139	73	74	47	45
31	.....	243	.....	139	71	.....	43	.....

NOTE.—Discharge computed from two well-defined rating curves, one used Apr. 15 to May 22, and the other May 23 to Nov. 30.

Monthly discharge of North Fork of South Platte River at Cassells, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April 16-30	125	54	74.2	2,210	B.
May	243	88	160	9,840	B.
June	262	160	212	12,600	B.
July	211	91	141	8,670	B.
August	139	71	86.5	5,320	B.
September	120	68	86.3	5,140	B.
October	100	43	63.3	3,890	A.
November	58	30	45.8	2,730	A.
The period	.....	.....	.....	50,400	

NORTH FORK OF SOUTH PLATTE RIVER AT SOUTH PLATTE, COLO.

Location.—One-third mile above South Platte. No tributary between station and mouth.

Records available.—January 4, 1909, to September 30, 1910; April 1 to December 31, 1913.

Drainage area.—449 square miles (measured from Hayden atlas).

Gage.—Inclined staff.

Control.—Somewhat shifting.

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Discharge measurements.—Made from car and cable during high and medium stages and by wading at low stages.

Winter flow.—Ice causes backwater; discharge measurements made to determine winter flow.

Diversions.—There are court decrees for diversions of 20 second-feet from North Fork between Cassells and South Platte and 60 second-feet from intervening tributaries. There are also a number of small ice and fish ponds which divert small amounts of water at various times.

Accuracy.—Mean daily gage heights based on one observation and may be somewhat in error; estimates therefore can not be considered better than good.

Cooperation.—Gage heights furnished by State engineer.

Discharge measurements of North Fork of South Platte River at South Platte, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 13	R. H. Fletcher		36	Aug. 8	R. H. Fletcher	2.10	137
Feb. 25	do		37	Sept. 29	Robert Follansbee	2.25	126
Apr. 1	do	1.80	76	Nov. 1	do	1.98	90
May 15	Raymond Richards	2.73	275	Dec. 29	R. H. Fletcher	[a] 3.70	67
June 16	R. H. Fletcher	3.00	380				

[a] Discharge relation affected by ice.

Daily gage height, in feet, of North Fork of South Platte River at South Platte, Colo., for 1913.

[Miss A. Vermillion, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.8	2.9	3.1	2.7	2.3	2.2	2.5	2.0	1.6
2	1.9	2.9	2.9	2.7	2.3	2.2	2.7	2.0	1.8
3	1.7	2.7	2.9	2.6	2.2	2.3	2.5	2.1	1.8
4	1.5	2.5	2.9	2.6	2.2	2.3	2.5	2.0	.....
5	1.7	2.8	2.8	2.5	2.3	2.4	2.3	2.0	.....
6	1.8	2.9	2.8	2.5	2.2	2.4	2.3	2.1	.....
7	1.8	3.0	2.9	2.4	2.2	2.3	2.3	2.1	.....
8	1.7	2.9	3.1	2.5	2.1	2.5	2.2	2.1	5.0
9	1.7	2.7	3.3	2.5	2.0	2.6	2.2	2.1	5.0
10	1.6	3.0	3.3	2.4	2.2	2.4	2.2	2.0	5.0
11	1.8	3.1	3.5	2.4	2.5	2.3	2.2	2.0	4.9
12	1.8	3.1	3.2	2.3	2.4	2.7	2.2	2.0	4.9
13	1.9	3.6	3.1	2.2	2.4	2.4	2.2	2.0	4.9
14	2.0	3.0	3.0	2.2	2.4	2.2	2.15	2.0	4.8
15	2.3	2.7	3.1	2.4	2.3	2.4	2.1	2.0	4.8
16	2.3	2.6	3.0	2.4	2.2	2.5	2.1	2.0	4.6
17	2.4	2.7	3.0	3.1	2.2	2.4	2.1	2.0	4.5
18	2.4	3.0	3.1	2.7	2.3	2.4	2.1	2.0	4.4
19	2.2	3.0	3.1	3.0	2.3	2.3	2.1	2.0	4.4
20	2.4	2.9	3.1	2.8	2.3	2.3	2.0	2.0	4.2
21	2.5	2.8	3.1	3.0	2.3	2.2	2.2	2.0	4.0
22	2.4	2.9	3.0	2.8	2.2	2.2	2.2	1.8	4.0
23	2.3	2.9	3.0	3.0	2.2	2.2	2.1	1.6	4.0
24	2.0	3.0	3.0	2.9	2.2	2.3	2.1	1.6	3.9
25	2.3	3.1	2.9	2.6	2.4	2.3	2.1	2.0	3.8
26	2.2	3.2	2.9	2.5	2.3	2.3	2.1	1.9	3.7
27	2.3	3.3	2.8	2.5	2.3	2.3	2.1	2.0	3.7
28	2.6	3.2	2.8	2.4	2.2	2.25	2.2	2.0	3.7
29	2.9	3.2	2.9	2.4	2.2	2.25	1.8	2.0	3.7
30	2.9	3.3	2.8	2.3	2.2	2.25	2.1	1.6	3.7
31	.....	3.2	.....	2.3	2.3	.....	2.0	.....	3.7

NOTE.—Ice present Jan. 1 to Mar. 31 and Dec. 8 to 31.

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Daily discharge, in second-feet, of North Fork of South Platte River at South Platte Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	76	343	424	274	171	150	180	90	46
2	93	343	343	274	171	150	230	90	54
3	61	274	343	244	150	171	188	107	54
4	35	217	343	244	150	171	188	90	54
5	61	307	307	217	171	193	146	90	93
6	76	343	307	217	150	193	146	107	130
7	76	382	343	193	150	171	146	107	130
8	61	343	424	217	130	217	126	107	93
9	61	274	517	217	111	244	126	107	76
10	47	382	517	193	150	193	126	90	68
11	76	424	620	193	217	171	126	90	54
12	76	424	469	171	193	274	126	90	54
13	93	675	424	150	193	193	126	90	54
14	111	382	382	150	193	150	116	90	68
15	171	274	424	193	171	191	107	90	68
16	171	244	382	193	150	212	107	90	68
17	193	274	382	424	150	186	107	90	68
18	193	382	424	274	171	184	107	90	54
19	150	382	424	382	171	160	107	90	68
20	193	343	424	307	171	158	90	90	54
21	217	307	424	382	171	136	126	90	54
22	193	343	382	307	150	134	126	59	54
23	171	343	382	382	150	132	107	36	54
24	111	382	382	343	150	150	107	36	68
25	171	424	343	244	193	148	107	90	84
26	150	469	343	217	171	146	107	74	84
27	171	517	307	217	171	144	107	90	76
28	244	469	307	193	150	130	126	90	68
29	343	469	343	193	150	125	59	90	68
30	343	517	307	171	150	125	107	36	68
31	.....	469	.....	171	171	.....	90	.....	76

NOTE.—Discharge determined as follows: Apr. 1 to Sept. 14, from a well-defined curve; Apr. 15 to Oct. 1, by indirect method for shifting channel; Oct. 1 to Nov. 30, from curve based on one measurement; Dec. 1–31, estimated because of effect of ice on discharge relation.

Monthly discharge of North Fork of South Platte River at South Platte, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
April	343	35	140	8,330	B.
May	675	217	378	23,200	B.
June	620	307	391	23,300	B.
July	424	150	243	14,900	B.
August	217	111	163	10,000	B.
September	274	125	170	10,100	B.
October	230	59	125	7,690	B.
November	107	36	85.9	5,110	C.
December	120	46	69.8	4,290	D.
The period	.....	.....	.....	107,000	

GENEVA CREEK AT GRANT, COLO.

Location.—In the Pike National Forest, at highway bridge, in sec. 9, T. 7 S., R. 74 W., at Grant post office, 300 feet above the mouth of creek.

Records available.—November 3, 1911, to December 31, 1913. From July 5, 1908, to November 3, 1911, a station was maintained at Sullivan's ranch, 3 miles above Grant. Except during the spring run-off, the flow at the two points is practically the same.

Drainage area.—74 square miles (measured from Forest atlas).

Gage.—Vertical staff.

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Channel.—Practically permanent during 1913.

Discharge measurements.—Made from bridge during high water and by wading at ordinary stages.

Winter flow.—Ice causes backwater during the winter months; discharge measurements made to determine approximate flow.

Diversions.—There is a court decree for a diversion of 1 second-foot from Geneva Creek above the station, and a temporary reservoir decree for 1,480 acre-feet from Geneva and Kerby creeks.

Accuracy.—Owing to the high altitude of this station considerable diurnal fluctuations are likely to be caused at certain seasons of the year by alternate melting and freezing; and the mean daily gage height based on morning and evening readings, together with the maximum gage height for the 24 hours, may be somewhat in error. For this reason the estimates can not be considered better than good.

Cooperation.—Gage heights furnished by the State engineer.

Discharge measurements of Geneva Creek at Grant, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Apr. 16	Robert Follansbee	1.15	28.3	Sept. 27	Robert Follansbee	1.39	58.2
May 22	R. H. Fletcher	1.71	123	28	do	1.30	48.1
June 17	do	1.80	143	Dec. 4[a]	R. H. Fletcher	1.22	18.3
Aug. 8	do	1.40	62	30[a]	do	.90	15.8

[a] Discharge relation affected by snow and slush ice.

Daily gage height, in feet, of Geneva Creek at Grant, Colo., for 1913.

[Mrs. M. McFarland, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.63	1.95	1.72	1.57	1.36	1.48	1.12	1.05
2	0.99	1.65	1.87	1.67	1.57	1.40	1.53	1.11	1.25
3	.....	1.43	1.87	1.67	1.53	1.50	1.43	1.15	1.20
4	.90	1.41	1.80	1.66	1.53	1.43	1.39	1.14	1.22
5	.....	1.59	1.82	1.65	1.53	1.47	1.40	1.14	1.38
6	.....	1.67	1.90	1.60	1.50	1.49	1.37	1.08	1.65
7	.....	1.72	1.95	1.60	1.47	1.47	1.25	1.12	1.88
8	.....	1.80	2.03	1.65	1.42	1.55	1.24	1.15	1.53
9	.95	1.76	2.02	1.77	1.41	1.51	1.26	1.11	1.92
10	.....	1.80	2.07	1.63	1.50	1.54	1.27	1.14	1.95
11	.95	1.78	2.03	1.57	1.60	1.54	1.28	1.10	1.85
12	.....	1.95	1.82	1.55	1.59	1.53	1.25	1.08	1.85
13	.....	2.10	1.92	1.50	1.49	1.46	1.33	1.08	1.85
14	.....	1.77	1.77	1.47	1.45	1.41	1.30	1.05	.....
15	.....	1.71	1.93	1.62	1.45	1.52	1.28	1.14	1.84
16	1.30	1.63	1.93	1.78	1.45	1.57	1.23	1.24	1.84
17	1.24	1.87	1.93	1.78	1.45	1.42	1.17	1.12	1.81
18	1.13	1.87	2.02	1.83	1.45	1.42	1.20	1.06	1.80
19	1.15	1.77	1.90	1.88	1.40	1.38	1.24	1.08	1.80
20	1.22	1.70	1.90	1.85	1.43	1.32	1.25	1.08	1.78
21	1.23	1.70	1.93	1.85	1.43	1.31	1.22	1.09	1.45
22	1.30	1.78	1.95	1.85	1.37	1.32	1.27	1.11	1.46
23	1.10	2.02	1.87	1.89	1.37	1.32	1.21	1.22	1.49
24	1.05	1.90	1.87	1.85	1.38	1.38	1.23	1.22	1.30
25	1.05	1.90	1.83	1.80	1.33	1.35	1.26	1.18	1.30
26	1.15	2.10	1.85	1.77	1.32	1.32	1.22	1.16	1.45
27	1.30	2.00	1.80	1.75	1.38	1.35	1.27	1.18	1.40
28	1.43	1.95	1.85	1.62	1.37	1.39	1.18	1.11	1.30
29	1.50	2.10	1.80	1.58	1.37	1.39	1.15	1.10	1.30
30	1.62	1.95	1.70	1.57	1.38	1.38	1.21	1.20	1.29
31	.....	2.03	.....	1.56	1.38	.....	1.15	.....	1.28

NOTE.—Discharge relation affected by ice during December.

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Daily discharge, in second-feet, of Geneva Creek, Grant, at Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	18	105	188	125	92	54	75	28	22
2	18	109	165	113	92	61	84	27	22
3	16	66	165	113	84	78	66	30	19
4	14	63	145	111	84	66	60	30	18
5	14	96	151	109	84	73	61	30	20
6	15	113	173	98	78	76	56	25	20
7	15	125	188	98	73	73	40	28	19
8	16	145	214	109	64	88	39	30	18
9	16	135	210	138	63	80	42	27	17
10	16	145	229	105	78	86	43	30	17
11	16	140	214	92	98	86	44	26	16
12	22	188	151	88	96	84	40	25	16
13	28	240	179	78	76	71	50	25	14
14	34	138	138	73	70	63	46	22	12
15	40	122	182	102	70	82	44	30	12
16	46	105	182	140	70	92	38	39	14
17	39	165	182	140	70	64	32	28	14
18	29	165	210	153	70	64	35	23	16
19	30	138	173	167	61	58	39	25	16
20	37	120	173	159	66	49	40	25	16
21	38	120	182	159	66	48	37	25	16
22	46	140	188	159	56	49	43	27	16
23	26	210	165	170	56	49	36	37	16
24	22	173	165	159	58	58	38	37	16
25	22	173	153	145	50	54	42	33	16
26	30	240	159	138	49	49	37	31	15
27	46	203	145	132	58	54	43	33	15
28	66	188	159	102	56	60	33	27	15
29	78	240	145	94	56	60	30	26	15
30	102	188	120	92	58	58	36	35	15
31	.....	214	.....	90	58	.....	30	.....	15

NOTE.—Discharge, except for December, determined from a rating curve that is well defined above 40 second-feet and fairly well defined below. Discharge for December estimated from two discharge measurements and the daily gage heights.

Monthly discharge of Geneva Creek at Grant, Colo., for 1913.

Month.	Discharge in second-feet.				Run-off.		Accuracy.
	Maximum.	Minimum.	Mean.	Per square mile.	Depth in inches on drainage area.	Total in acre-feet.	
April	102	14	31.8	0.430	0.48	1,890	C.
May	240	63	152	2.05	2.36	9,350	B.
June	229	120	173	2.34	2.61	10,300	B.
July	170	73	121	1.64	1.89	7,440	B.
August	98	49	69.7	.942	1.09	4,290	B.
September	92	48	66.2	.895	1.00	3,940	B.
October	84	30	44.5	.601	.69	2,740	B.
November	39	22	28.8	.389	.43	1,710	C.
December	22	12	16.4	.222	.26	1,010	C.
The period	.....	.....	.....	.....	.....	42,700	

NOTE.—Accuracy reduced because of probable error in mean daily gage heights. See station description.

SCOTT GOMER CREEK [1] NEAR GRANT, COLO.

Location.—Near Sullivan's ranch, in sec. 19, T. 6 S., R. 74 W., in Pike National Forest, about 5 miles above Grant, one-fourth mile above mouth of creek. No tributary enters between mouth and station.

Records available.—Fragmentary records August 16, 1909, to November 28, 1913.

[1] Also called East Geneva Creek.

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Drainage area.—21 square miles (measured from topographic sheet).

Gage.—Vertical staff; moved to its present position 2¾ miles below original site September 4, 1909. Datum unchanged in new location, but has no determined relation to datum of original gage.

Control.—Permanent during 1913.

Discharge measurements.—Made by wading.

Winter flow.—Ice causes backwater during the winter months.

Diversions.—There are no court decrees for diversions above this station and therefore the records probably represent the natural run-off.

Accuracy.—Owing to the high altitude of this station, considerable diurnal fluctuations are likely to be caused at certain seasons of the year by alternate melting and freezing, and the mean daily gage height based on one gage height may be considerably in error. As there are so few gage heights, estimates have been made only for the days when the gage was read and can be considered only fair.

Cooperation.—Station maintained in cooperation with United States Forest Service

Discharge measurements of Scott Gomer Creek near Grant, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
June 17	R. H. Fletcher	1.28	26
Aug. 7	do	1.03	17
Sept. 27	Robert Follansbee	1.29	28

Daily gage height, in feet, of Scott Gomer Creek near Grant, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1						1.0		0.85
2								
3							1.2	
4			1.35					
5					1.0			
6								
7			1.25					
8			1.55		1.05		1.05	1.0
9								
10		1.35		1.2				
11	0.35		1.5					
12						1.45		.85
13		1.6						
14					1.15			
15								
16	.4							
17			1.32				1.05	
18						1.25		
19				1.55				
20					1.05			
21	.45				1.0			.70
22		1.7				1.25		
23			1.1					
24				1.5				
25								
26								
27						1.25		
28	.6			1.5				1.0
29					1.0			
30			1.35					
31		2.05						

NOTE.—Ice present Nov. 28 to Dec. 31.

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Daily discharge, in second-feet, of Scott Gomer Creek near Grant, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1						16		12
2								
3							23	
4			30					
5					16			
6								
7			25					
8			42		18		18	16
9								
10		30		23				
11	3.0		39					
12						36		7.2
13		46						
14					21			
15								
16	3.5							
17			28				18	
18						25		
19				42				
20					18			
21	4.2				16			8.0
22		54				25		
23			19					
24				39				
25								
26								
27						25		
28	6.5			39				
29					16			
30			30					
31		95						

CLEAR CREEK NEAR GOLDEN, COLO.

Location.—About 2 miles above Golden, in sec. 6, T. 4 S., R. 70 W., and a short distance below the headgate of the Golden ditch. The only important tributary between the station and the mouth is Ralston Creek, which enters about 12 miles below.

Records available.—December 4, 1908, to December 31, 1909; June 8 to September 24, 1911; January 1, 1912, to December 31, 1913.

Drainage area.—Approximately 380 square miles.

Gage.—Automatic recording gage.

Control.—Slightly shifting.

Discharge measurements.—Made from car and cable located near gage.

Winter flow.—Ice causes backwater during the winter months.

Diversions.—There is a court decree for a diversion of 53 second-feet from the headwaters of Fraser River to the West Fork of Clear Creek. During 1913, 1,120 acre-feet were diverted. Above the Golden station there is a court decree for a diversion of 26 second-feet by the Golden ditch. Below there are decrees for diversions of 1,642 second-feet.

Accuracy.—Conditions favorable for accurate results; records should be reliable.

Cooperation.—Station maintained in cooperation with the Farmers' Reservoir Irrigation Co.

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Discharge measurements of Clear Creek near Golden, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Jan. 15	R. H. Fletcher	1.50	53	Aug. 13	R. H. Fletcher	2.10	289
Feb. 24	do	1.30	47	Oct. 21	Thos. Grieve, Jr.	1.63	125
Mar. 8	do	1.10	50	Nov. 4	R. H. Fletcher	1.60	149
July 11	do	2.42	391	Dec. 27	do	2.92	76

Daily gage height, in feet, of Clear Creek near Golden, Colo., for 1913.

[John Trefford, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	.....	1.94	3.25	2.65	2.30	.....	2.10	1.65
2	.....	1.30	1.92	3.15	2.65	2.20	.....	2.10	1.60
3	.....	.....	1.85	3.05	2.55	2.10	.....	2.05	1.60
4	.....	.....	1.82	2.98	2.50	2.10	.....	2.00	1.65
5	.....	.....	1.90	2.91	2.50	2.15	.....	1.98	1.67
6	.....	.....	2.02	2.97	2.50	2.20	.....	1.95	1.69
7	.....	.....	2.16	2.88	2.50	2.15	.....	1.80	1.71
8	1.10	.....	2.16	2.80	2.50	2.10	.....	.....	1.65
9	1.10	1.10	2.16	2.79	2.45	1.93	.....	.....	1.60
10	1.10	.....	2.16	2.85	2.45	2.00	.....	.....	1.50
11	1.10	.....	2.33	3.05	2.40	2.20	.....	.....	1.62
12	1.10	.....	2.50	2.92	2.35	2.20	.....	.....	1.63
13	1.10	.....	2.62	2.85	2.20	2.15	.....	.....	1.62
14	1.10	.....	2.49	2.80	2.25	2.10	.....	.....	1.64
15	1.10	.....	2.31	2.89	2.40	2.05	.....	1.70	1.62
16	1.10	1.33	2.20	2.96	2.55	2.00	.....	1.70	1.55
17	1.10	1.50	2.28	2.95	2.75	1.99	.....	1.65	1.55
18	1.10	1.52	2.33	3.20	2.80	2.00	.....	1.65	1.62
19	1.10	1.49	2.42	3.20	2.80	1.95	1.92	1.65	1.60
20	1.10	1.58	2.43	3.15	2.65	1.92	1.98	1.65	1.60
21	1.10	1.75	2.34	3.10	2.80	1.93	2.00	1.65	1.63
22	1.10	1.71	2.28	3.00	2.80	1.92	1.97	.....	1.42
23	1.10	1.60	2.40	3.00	2.80	1.96	1.94	.....	1.35
24	1.10	1.52	2.62	2.90	2.95	1.96	1.90	1.70	1.41
25	1.10	1.58	2.78	2.82	2.75	1.87	1.85	1.70	1.53
26	1.05	1.52	3.20	2.75	2.65	1.84	1.88	1.55	1.48
27	.....	1.57	3.35	2.80	2.60	1.85	1.88	1.65	1.40
28	1.20	1.67	2.98	3.05	2.50	.....	1.84	1.60	1.40
29	.....	1.77	3.05	3.05	2.50	.....	1.85	1.40	1.60
30	1.16	1.89	3.30	2.81	2.40	.....	1.85	1.60	1.25
31	1.22	.....	3.20	.....	2.35	.....	.....	1.65	.....

NOTE.—Ice present Jan. 1 to Mar. 7 and Dec. 1 to 31.

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Daily discharge, in second-feet, of Clear Creek near Golden, Colo., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	50	74	241	882	520	368	215	294	157
2	50	80	234	810	520	330	215	294	144
3	50	60	213	742	472	294	215	277	144
4	50	40	204	698	450	294	220	260	157
5	50	55	228	656	450	312	220	254	162
6	50	60	267	692	450	330	220	244	167
7	50	60	316	639	450	312	220	198	173
8	52	56	316	595	450	294	.....	194	157
9	52	52	316	590	429	238	.....	190	144
10	52	50	316	622	429	260	.....	187	120
11	52	55	380	742	408	330	.....	184	149
12	52	60	450	662	388	330	.....	180	152
13	52	65	505	622	330	312	.....	177	149
14	52	70	446	595	349	294	.....	173	154
15	52	80	372	644	408	277	.....	170	149
16	52	85	330	686	472	260	.....	170	132
17	52	120	360	680	570	257	.....	157	132
18	52	125	380	845	595	260	.....	157	149
19	52	116	416	845	595	244	234	157	144
20	52	139	421	810	520	234	254	157	144
21	52	184	384	775	595	238	260	157	152
22	52	173	360	710	595	234	250	163	102
23	52	144	408	710	595	216	241	166	89
24	52	125	505	650	680	247	228	170	100
25	52	139	585	606	570	219	213	170	12
26	47	125	845	570	520	210	222	132	116
27	56	137	960	595	495	213	222	157	96
28	65	162	698	742	450	213	210	144	96
29	62	190	742	742	450	213	213	98	144
30	60	225	920	600	408	213	213	144	72
31	68	.....	845	.....	388	213	.....	157	.....

NOTE.—Discharge computed from a rating curve well defined below 450 second-feet; above that point it may be from 5 to 10 per cent in error. Discharge estimated for days for which gage heights are missing by comparison with records of nearby stations, except for the period Sept. 8 to 18, when rain prevented observation of gage heights.

Monthly discharge of Clear Creek near Golden, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March	68	47	53.0	3,260	A.
April	225	40	104	6,190	B.
May	960	204	450	27,700	A.
June	882	570	692	41,200	B.
July	680	330	484	29,800	A.
August	368	210	266	16,400	A.
October	294	98	185	11,400	B.
November	173	72	136	8,090	A.

ST. VRAIN CREEK AT LYONS, COLO.

Location.—Three-fourths of a mile below Lyons, in sec. 17, T. 3 N., R. 70 W., one-fourth mile below junction of North and South St. Vrain creeks, and just below Stone Canyon.

Records available.—August 1, 1887, to October 31, 1890; June 13, 1895, to October 31, 1903; July 1, 1904, to November 30, 1913.

Drainage area.—209 square miles (measured from Hayden's atlas).

Gage.—Inclined staff gage installed August 9, 1909, at practically same datum as inclined staff gage used from 1895 to 1903. It is not known whether the gage used prior to 1895 was located at present site.

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Control.—Character not known, as only computed records are received.
Discharge measurements.—Made from car and cable.
Winter flow.—Ice causes backwater during a portion of the winter months.
Diversions.—There are court decrees for the diversion of 166 second-feet from the St. Vrain and tributaries above station. Below there are court decrees for 1,632 second-feet from St. Vrain Creek and flood-water diversions of 190,000 acre-feet.
Cooperation.—Records from 1887 to 1890 and from July 1 1904, to 1913. furnished by the State engineer.

Daily gage height, in feet, of St. Vrain Creek at Lyons, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	2.7	3.5	2.95	2.5	2.3	2.3	1.85
2	.....	2.7	3.5	2.9	2.5	2.3	2.3	1.8
3	.....	2.7	3.55	2.85	2.6	2.4	2.25	1.8
4	.....	2.7	3.55	2.9	2.6	2.4	2.35	1.7
5	.....	2.65	3.5	2.9	2.6	2.5	2.4	1.7
6	.....	2.7	3.5	3.0	2.6	2.5	2.3	1.8
7	.....	2.8	3.4	3.0	2.6	2.5	2.3	1.8
8	.....	2.8	3.5	3.0	2.5	2.75	2.3	1.8
9	2.1	3.5	3.15	2.85	2.5	2.6	2.2	1.8
10	2.1	3.3	3.25	3.1	2.5	2.4	2.1	1.7
11	2.1	3.35	3.6	2.95	2.5	2.4	2.0	1.7
12	2.2	3.35	3.4	2.8	2.5	2.4	2.2	1.7
13	2.35	3.3	3.2	2.7	2.45	2.3	2.3	1.7
14	2.5	3.5	3.15	2.65	2.45	2.2	2.25	1.7
15	2.5	3.25	3.3	3.1	2.4	2.2	2.25	1.7
16	2.5	3.05	3.4	2.95	2.4	2.3	2.2	1.7
17	2.55	3.0	3.3	2.95	2.4	2.15	2.2	1.65
18	2.65	3.05	3.4	3.05	2.4	2.1	2.2	1.6
19	2.75	3.0	3.4	3.15	2.4	2.1	2.2	1.7
20	2.9	2.9	3.35	2.9	2.4	2.1	2.1	1.6
21	2.95	2.8	3.3	3.05	2.4	2.1	2.0	1.6
22	2.9	2.7	3.2	3.2	2.35	2.05	2.0	1.55
23	2.8	3.0	3.2	3.2	2.35	2.05	1.9	1.55
24	2.75	3.05	3.15	3.3	2.35	2.1	1.8	1.55
25	2.7	3.2	3.15	3.0	2.4	2.1	1.8	1.7
26	2.7	3.2	3.1	2.8	2.3	2.1	1.7	1.7
27	2.65	3.45	3.1	2.65	2.3	2.1	1.7	1.6
28	2.65	3.45	3.1	2.6	2.3	2.05	1.7	1.55
29	2.65	3.45	3.1	2.6	2.3	2.0	1.7	1.5
30	2.7	3.45	3.0	2.6	2.2	2.0	1.7	1.5
31	.....	3.5	.....	2.5	2.3	.....	1.8	.....

Daily discharge, in second-feet, of St. Vrain Creek at Lyons, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Day.	Apr.	May.	June.	July.	Aug.
1	.....	138	382	197	98	16	98	224	342	197	82
2	.....	138	382	184	98	17	108	210	306	197	82
3	.....	138	404	172	118	18	128	224	342	224	82
4	.....	138	404	184	118	19	149	210	342	254	82
5	.....	128	382	184	118	20	184	184	324	184	82
6	.....	138	382	210	118	21	197	160	306	224	82
7	.....	160	342	210	118	22	184	138	270	270	74
8	.....	160	382	210	98	23	160	210	270	270	74
9	38	382	254	172	98	24	149	224	254	306	74
10	38	306	288	238	98	25	138	270	254	210	74
11	38	324	426	197	98	26	138	270	238	160	66
12	52	324	342	160	98	27	128	362	238	138	66
13	74	306	270	138	90	28	128	362	238	118	66
14	98	382	254	128	90	29	128	362	238	118	66
15	98	288	306	238	82	30	138	362	210	118	52
						31	.....	382	.....	98	66

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Monthly discharge of St. Vrain Creek near Lyons, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
April 9-30	197	38	118	5,150
May	382	128	245	15,100
June	426	210	312	18,600
July	306	98	190	11,700
August	118	52	87.6	5,390

BOULDER CREEK AT ORODELL, COLO.

Location.—At Orodell station, in sec. 27, T. 1 N., R. 71 W., just below mouth of Fourmile Creek.

Records available.—March 18, 1907, to December 31, 1913. From May 14, 1895, to December 20, 1909, a station was maintained about 1 mile below present site chiefly by the State engineer. The records at the two points are not directly comparable, as some water is diverted for irrigation between. From 1902 to 1906 the records for lower station were published only in reports of the State engineer.

Drainage area.—108 square miles (State engineer's report).

Gage.—Automatic recording gage owned by Colorado Power Co.

Control.—Character not known, as only computed records are furnished.

Discharge measurements.—Made from car and cable.

Winter flow.—Ice causes backwater during the winter months; discharge measurements made to determine flow.

Diversions.—There are no diversions from Boulder Creek above the station, but there are court decrees for diversions of 165 second-feet from tributaries entering above. Below the station there are decrees for diversions of 2,871 second-feet from Boulder Creek.

Cooperation.—Station maintained by the State engineer in cooperation with the Colorado Power Co., by which records are furnished.

Discharge measurements of Boulder Creek at Orodell, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec. ft.*
Jan. 30	M. E. Bunger	2.05	40	May 13	M. E. Bunger	2.28	61
Feb. 27	do	1.80	17	July 8	do	2.82	153
Mar. 19	do	1.88	22	Oct. 22	D. L. Bundy		115

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Daily gage height, in feet, of Boulder Creek at Orodell, Colo., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.8	1.9	.....	1.9	2.15	3.3	2.8	2.6	2.05	.....	2.05	2.1
2	2.1	.....	1.75	1.9	2.15	3.25	2.75	.....	2.2	.....	.....	2.1
3	1.65	.....	1.9	.....	2.15	3.25	2.75	.....	2.15	.....	2.0	2.15
4	.....	.....	1.95	.....	2.1	3.25	2.75	.....	2.4	.....	2.1	2.1
5	.....	.....	1.95	2.2	2.2	3.25	2.75	.....	2.45	2.15	2.15	2.0
6	.....	.....	1.9	2.2	2.25	3.2	2.8	.....	2.45	2.4	2.15	2.05
7	.....	.....	1.95	2.25	2.3	3.05	2.85	.....	2.4	2.2	2.15	.....
8	.....	.....	1.85	2.3	2.35	3.05	2.8	.....	2.6	2.25	.....	.....
9	.....	.....	.....	2.25	2.35	3.0	2.7	.....	2.55	2.2	1.9	2.05
10	.....	.....	1.7	2.25	2.3	3.05	2.7	2.35	2.55	2.15	2.05	2.15
11	.....	2.05	2.0	2.3	2.3	3.15	2.75	2.4	.....	2.0	2.1	2.25
12	.....	2.0	1.95	2.35	2.3	3.15	2.55	2.25	.....	2.1	2.05	2.3
13	.....	2.05	1.95	2.25	2.3	3.15	2.55	2.25	2.5	2.2	.....	2.3
14	.....	2.05	2.1	2.4	2.25	3.1	2.55	2.3	2.3	2.05	.....	.....
15	.....	2.05	1.95	2.4	2.2	3.0	2.7	2.25	.....	.....	.....	2.25
16	.....	1.8	.....	2.3	2.15	3.05	2.6	2.25	.....	.....	.....	2.3
17	.....	1.95	1.9	2.2	2.2	2.95	2.65	2.15	2.15	.....	.....	2.25
18	2.0	1.95	2.0	2.2	2.25	3.0	2.7	2.25	2.15	.....	.....	2.2
19	.....	2.05	1.7	2.1	2.25	3.05	2.7	2.15	2.1	2.05	.....	2.2
20	1.75	2.05	1.75	2.15	2.25	3.05	2.75	2.15	2.05	2.25	.....	2.1
21	1.95	1.95	.....	2.25	2.25	3.05	2.85	2.35	2.25	2.25	2.0	2.25
22	1.95	.....	.....	2.2	2.3	3.1	2.9	2.05	2.15	2.2	.....	2.3
23	1.95	.....	1.65	2.15	2.3	3.15	2.85	2.15	2.15	.....	.....	2.3
24	2.0	1.8	1.75	.....	2.35	3.1	2.8	.....	2.1	.....	.....	2.3
25	1.8	2.1	1.55	.....	2.35	3.05	2.8	2.15	2.05	.....	2.0	2.25
26	.....	2.0	.....	.....	2.45	2.95	2.75	2.3	2.25	2.05	.....	2.25
27	1.9	1.95	2.15	2.15	2.7	2.95	2.7	2.2	2.15	2.2	.....	2.1
28	2.0	2.05	2.05	2.15	2.8	2.95	2.8	2.25	.....	2.15	1.95	.....
29	2.0	.....	1.9	2.15	3.0	2.85	2.65	2.1	.....	.....	1.95	.....
30	2.0	.....	1.95	2.15	2.85	2.85	2.65	2.0	.....	.....	1.85	.....
31	2.0	.....	1.95	.....	3.0	.....	2.65	2.0	.....	.....	.....	.....

Daily discharge, in second-feet, of Boulder Creek at Orodell, Colo., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	20	27	.....	27	51	328	157	117	40	51	40	45
2	45	28	17	27	51	308	147	112	57	51	38	45
3	12	29	27	37	51	308	147	107	51	51	36	51
4	.....	30	32	47	45	308	147	102	84	51	45	45
5	.....	31	32	57	57	308	147	97	92	51	51	36
6	.....	33	27	57	64	287	157	92	92	84	51	40
7	.....	34	32	64	70	231	170	87	84	57	51	40
8	.....	36	24	70	77	231	157	82	117	64	39	40
9	.....	38	19	64	77	214	137	77	108	57	27	40
10	.....	40	14	64	70	231	137	77	108	51	40	51
11	.....	40	36	70	70	268	147	84	106	36	45	64
12	.....	36	32	77	70	268	108	64	103	45	40	70
13	.....	40	32	64	70	268	108	64	100	57	40	70
14	.....	40	45	84	64	248	108	70	70	40	40	67
15	.....	40	32	84	57	214	137	64	64	40	40	64
16	.....	20	30	70	51	231	117	64	57	40	39	70
17	.....	32	27	57	57	199	127	51	51	40	39	64
18	36	32	36	57	64	214	137	64	51	40	39	57
19	.....	40	14	45	64	231	137	51	45	40	38	57
20	17	40	17	51	64	231	147	51	40	64	38	45
21	32	32	15	64	64	231	170	77	64	64	36	64
22	32	29	14	57	70	248	184	40	51	57	36	70
23	32	26	12	51	70	268	170	51	51	53	36	70
24	36	20	17	51	77	248	157	51	45	49	36	70
25	20	45	8	51	77	231	157	51	40	44	36	64
26	24	36	.....	51	92	199	147	70	64	40	35	64
27	27	32	51	51	137	199	137	57	51	57	33	45
28	36	40	40	51	157	199	157	64	51	51	32	42
29	36	.....	27	51	214	170	127	45	51	48	32	40
30	36	.....	32	51	170	170	127	36	51	45	24	38
31	36	.....	32	.....	214	.....	127	36	.....	42	.....	36

NOTE—Discharge for days for which gage heights are missing interpolated except Jan. 4–17, 19, and Mar. 1 and 26, when the flow was largely controlled by the power plant.

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Monthly discharge of Boulder Creek at Orodell, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
January (16 days)	45	12	29.8	946
February	45	20	33.8	1,880
March (29 days)	51	8	26.7	1,540
April	84	27	56.7	3,370
May	214	45	83.4	5,130
June	328	170	243	14,500
July	184	108	143	8,790
August	117	36	69.5	4,270
September	117	40	68.0	4,050
October	84	40	50.3	3,090
November	51	24	38.4	2,280
December	70	36	53.7	3,300

SOUTH BOULDER CREEK NEAR ROLLINSVILLE, COLO.

Location.—At highway bridge in sec. 35, T. 1 S., R. 73 W., 1 mile west of Rollinsville in Pike National Forest. The nearest important tributary, Jennie Creek, enters 4 miles above.

Records available.—September 10, 1910, to December 31, 1913.

Drainage area.—39 square miles (measured from topographic sheets).

Gage.—Vertical staff.

Control.—Fairly permanent.

Discharge measurements.—Made from bridge during high water and by wading at ordinary stages.

Winter flow.—Ice causes backwater.

Diversions.—No court decrees for diversions above station; records probably represent the natural run-off.

Accuracy.—Owing to the high altitude of the station, considerable diurnal fluctuation is likely to be caused at certain seasons by alternate melting and freezing, and the mean daily gage height based on one reading may be considerably in error. For this reason the estimates can not be considered better than fair.

Cooperation.—Station maintained in cooperation with United States Forest Service.

Discharge measurements of South Boulder Creek near Rollinsville, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 15	R. H. Fletcher	1.90	145
July 4	.....do	1.60	65

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Daily gage height, in feet, of South Boulder Creek near Rollinsville, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1		1.72		1.9			1.3		
2				1.9					
3		1.72	2.45	1.7		1.3		1.2	
4			2.4		1.3				
5			2.4	1.8		1.4			
6		1.87		1.7	1.3		1.4	1.3	
7				1.7	1.28		1.5		
8		1.77			1.2	1.7			
9		1.92			1.2	1.5			
10			2.2	1.6	1.2	1.45			
11		1.87	2.4	1.5		1.4	1.4		2.7
12		2.05	2.3	1.5				1.3	
13		2.07	2.2		1.3		1.45		
14					1.2	1.26		1.25	
15		1.88			1.15	1.26		1.3	
16		1.9			1.2		1.25		
17				1.7			1.2		
18			2.3		1.2	1.2	1.1	1.15	
19		2.1		1.7				1.15	
20		1.9							
21			2.2	1.4	1.1		1.3		
22									
23			2.1			1.3	1.3		1.6
24		2.1	2.05	1.7			1.3		
25		2.1		1.55	1.1		1.3		
26		2.5						1.15	.8
27		2.6	1.95			1.3			
28	1.7		1.95		1.1		1.3		
29		2.6	2.0		1.1	1.3		1.1	
30				1.35	1.05			1.5	
31		2.6		1.35	1.08		1.25		

NOTE.—Ice present Nov. 30 to Dec. 31.

Daily discharge, in second-feet, of South Boulder Creek near Rollinsville, Colo. for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1		113	283	115	38	24	35	30
2		113	271	115	37	29	37	28
3		113	260	85	36	35	39	27
4		122	248	92	35	40	41	26
5		131	248	100	35	45	43	22
6		140	239	85	35	58	45	25
7		131	231	85	33	71	57	25
8		122	222	80	27	85	54	25
9		149	214	75	27	57	51	25
10		144	205	70	27	51	48	25
11		140	248	57	30	45	45	25
12		175	226	57	32	40	48	25
13		179	205	63	35	35	51	23
14		160	202	68	27	31	44	31
15		141	199	74	24	31	38	26
16		145	196	79	27	29	31	31
17		158	193	85	27	28	27	26
18		172	190	85	27	27	20	24
19		185	183	85	24	29	25	24
20		145	177	65	22	30	30	24
21		155	170	45	20	32	35	24
22		165	160	58	20	33	35	24
23		175	150	71	20	35	35	24
24		185	140	85	20	35	35	24
25		185	134	64	20	35	35	24
26		271	128	59	20	35	35	24
27		295	122	54	20	35	35	23
28	110	295	122	50	20	35	35	21
29		295	130	45	20	35	34	20
30		295	122	40	17	35	32	20
31		295		40	19		31	

NOTE.—Discharge determined from two fairly well-defined rating curves applicable Apr. 28 to June 13 and June 18 to Nov. 29. Discharge estimated for Nov. 30 and interpolated for days of no gage height.

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Monthly discharge of South Boulder Creek near Rollinsville, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
May	295	113	177	10,900	B.
June	283	122	194	11,500	C.
July	115	40	72.0	4,430	B.
August	38	17	26.5	1,630	C.
September	85	24	38.8	2,310	C.
October	57	20	38.3	2,360	C.
November	35	20	28.3	1,680	C.
The period				34,800	

SOUTH BOULDER CREEK AT ELDORADO SPRINGS, COLO.[1]

Location.—At mouth of canyon at Eldorado Springs, in sec. 30, T. 1 S., R. 70 W., 3 miles southwest of Marshall. No important tributaries within several miles.

Records available.—May 15, 1895, to September 30, 1901; July 1, 1904, to December 13, 1913.

Drainage area.—125 square miles (measured from topographic sheet).

Gage.—Vertical staff; datum unchanged.

Control.—Character not known; only completed estimates received.

Discharge measurements.—Made by wading.

Winter flow.—Ice causes backwater during winter months; records discontinued.

Diversions.—There are court decrees for diversions of 137 second-feet above the station and 1,658 second-feet blow. There are also a number of flood-water decrees.

Cooperation.—Station maintained since 1904 by State engineer, who furnishes the records. The records for 1904 to 1908 were published only in reports of the State engineer.

Discharge measurements of South Boulder Creek at Eldorado Springs, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
May 14	M. E. Bunger	1.75	75
July 8	....do	1.75	77.4
Oct. 24	D. L. Bundy	1.40	21.3

[1] Called South Boulder Creek near Marshall in 1910 report.

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Daily gage height, in feet, of South Boulder Creek at Eldorado Springs, Colo., for 1913.

[B. E. Chessbro, observer.]

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	1.5	2.0	2.45	1.9	1.4	1.3	1.6	0.90	0.80
2	1.5	2.0	2.4	1.85	1.4	1.2	1.6	.85	.80
3	1.3	1.95	2.4	1.8	1.4	1.35	1.5	.90	.80
4	1.3	1.9	2.4	1.8	1.45	1.25	1.6	.85	.80
5	1.3	1.7	2.3	1.8	1.5	1.25	1.55	.85	.80
6	1.4	1.4	2.3	1.8	1.5	1.2	1.5	.80	.70
7	1.4	1.3	2.2	1.75	1.4	1.2	1.4	.95	.60
8	1.3	1.6	2.2	1.75	1.35	1.5	1.45	.90	.60
9	1.25	1.75	2.25	1.7	1.3	1.7	1.5	1.15	.60
10	1.2	1.3	2.3	1.7	1.4	1.6	1.4	.80	.95
11	1.4	1.6	2.4	1.7	1.4	1.5	1.35	.70	1.4
12	1.4	1.7	2.35	1.6	1.4	1.4	1.5	.85	1.4
13	1.5	1.9	2.25	1.6	1.35	1.3	1.5	.80	1.4
14	1.6	1.8	2.1	1.6	1.35	1.4	1.5	.70	.....
15	1.7	1.55	2.15	1.7	1.3	1.45	1.45	.95	.....
16	1.7	1.5	2.15	1.7	1.3	1.45	1.4	.95	.....
17	1.75	1.7	2.15	1.8	1.3	1.5	1.4	.80	.....
18	1.7	1.6	2.2	1.8	1.3	1.4	1.4	.80	.....
19	1.7	1.7	2.2	1.7	1.3	1.4	1.4	.80	.....
20	1.8	2.05	2.2	1.7	1.25	1.4	1.45	.80	.....
21	1.8	1.9	2.2	1.8	1.25	1.35	1.45	.85	.....
22	1.85	1.9	2.15	1.7	1.25	1.3	1.5	1.0	.....
23	1.8	2.0	2.15	1.8	1.2	1.35	1.25	.90	.....
24	1.75	2.1	2.15	1.8	1.2	1.4	1.3	1.2	.....
25	1.7	2.15	2.05	1.7	1.25	1.4	1.0	1.3	.....
26	1.7	2.25	2.0	1.7	1.2	1.4	.60	1.3	.....
27	1.75	2.4	2.0	1.7	1.2	1.4	.70	1.25	.....
28	1.8	2.4	2.0	1.6	1.2	1.35	.80	1.3	.....
29	1.9	2.5	2.0	1.6	1.2	1.4	.90	.70	.....
30	1.9	2.5	1.9	1.5	1.2	1.4	.90	.80	.....
31	.....	2.45	.....	1.5	1.2	.....	.90	.....	.....

Daily discharge, in second-feet, of South Boulder Creek at Eldorado Springs, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	43	125	254	105	33	25	55	5.0	3.0
2	43	125	237	95	33	19	55	4.0	3.0
3	25	116	237	85	33	29	43	5.0	3.0
4	25	105	237	85	38	22	55	4.0	3.0
5	25	69	207	85	43	22	49	4.0	3.0
6	33	33	207	85	43	19	43	3.0	1.5
7	33	25	179	77	33	19	33	7.0	1.0
8	25	55	179	77	29	43	38	5.0	1.0
9	22	77	193	69	25	69	43	16.0	1.0
10	19	25	207	69	33	55	33	3.0	5.0
11	33	55	237	69	33	43	29	1.5	.....
12	33	69	222	55	33	33	43	4.0	.....
13	43	105	193	55	29	25	43	3.0	.....
14	55	85	152	55	29	33	43	1.5	.....
15	69	49	166	69	25	38	38	7.0	.....
16	69	43	166	69	25	38	33	7.0	.....
17	77	69	166	85	25	43	33	3.0	.....
18	69	55	179	85	25	33	33	3.0	.....
19	69	69	179	69	25	33	33	3.0	.....
20	85	140	179	69	22	33	38	3.0	.....
21	85	105	179	85	22	29	38	4.0	.....
22	95	105	166	69	22	25	43	9.0	.....
23	85	127	166	85	19	29	22	5.0	.....
24	77	152	166	85	19	33	25	19	.....
25	69	166	140	69	22	33	9.0	25	.....
26	69	193	125	69	19	33	1.0	25	.....
27	77	237	125	69	19	33	1.5	22	.....
28	85	237	125	55	19	29	3.0	25	.....
29	105	270	125	55	19	33	5.0	1.5	.....
30	105	270	105	43	19	33	5.0	3.0	.....
31	.....	254	.....	43	19	.....	5.0	.....	.....

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Monthly discharge of South Boulder Creek at Eldorado Springs, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
April	105	19	58.2	3,460
May	270	25	116	7,130
June	254	105	180	10,700
July	105	43	72.2	4,440
August	43	19	26.8	1,650
September	69	19	32.8	1,950
October	55	1.0	31.3	1,920
November	25	1.5	7.68	457
December 1-10	5.0	1.0	2.45	48.6
The period				31,800

CACHE LA POUDRE RIVER AT MOUTH OF CANYON, NEAR FORT COLLINS, COLO.

Location.—In sec. 15, T. 8 N., R. 70 W., 3 miles below intake of Fort Collins waterworks, and 12 miles above Fort Collins, half a mile above mouth of Lewstone Creek.

Records available.—March 15, 1884, to October 15, 1901; February 3, 1910, to November 26, 1913.

Drainage area.—1,060 square miles.

Gage.—An automatic recording gage installed November 30, 1909. No information available concerning gage used from 1884 to 1901.

Control.—Character not known; only completed records furnished.

Discharge measurements.—Made from car and cable.

Winter flow.—Ice causes backwater during winter months and measurements are made to determine flow.

Diversions.—There is a court decree for a diversion of 57 second-feet from Cache la Poudre River above station and decrees for diversions of 526 second-feet from tributaries entering above, including Wyoming diversions. Below station there are decrees for diversions of 3,105 second-feet from the river. In addition there are a number of decrees for flood-water diversions. There are also decrees for diversions of 688 second-feet from Laramie River and 121 second-feet from headwaters of North Platte River to headwaters of Cache la Poudre through Chambers Lake. During 1913 a total of 15,220 acre-feet were diverted from the Laramie and 3,750 acre-feet from the North Platte. From North Fork of Grand River there are decrees for a diversion of 525 second feet to headwaters of Cache la Poudre River. During 1913, 12,200 acre-feet were diverted.

Cooperation.—From 1884 to 1901 the records were collected by Prof. L. G. Carpenter, of the Colorado State Agricultural College. Since 1910 records have been furnished by the State engineer, by whom the station is maintained.

Discharge measurements of Cache la Poudre River at mouth of canyon, near Fort Collins, Colo., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec. ft.*			*Feet.*	*Sec.-ft.*
Jan. 29	M. E. Bunger	1.60	38	June 12	M. E. Bunger	3.20	1,350
Feb. 26	do	1.45	54	July 11	do	2.24	608
Mar. 18	do	1.05	57	Oct. 13	D. L. Bundy	1.48	205
May 12	do	2.72	940				

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Daily gage height, in feet, of Cache la Poudre River at mouth of canyon, near Fort Collins, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	1.4	3.6	2.3	1.7	1.55	1.35	1.3
2	.....	1.4	3.35	2.2	1.7	1.55	1.35	1.3
3	.....	1.35	3.25	2.2	1.75	1.6	1.5	1.3
4	.....	1.3	3.25	2.2	1.3	1.45	1.6	1.3
5	.....	1.45	3.2	2.2	1.85	1.45	1.6	1.3
6	.....	1.6	3.05	2.2	1.9	1.5	1.55	1.4
7	.....	1.8	2.9	2.1	1.85	1.4	1.45	1.2
8	.....	1.9	2.9	2.05	1.85	1.95	1.35	1.05
9	.....	1.95	2.95	2.05	1.8	1.85	1.45	1.1
10	.....	2.05	2.95	2.15	1.8	1.75	1.35	1.3
11	.....	2.35	3.35	2.25	1.75	1.7	1.35	1.45
12	1.05	2.6	3.15	2.1	1.85	1.65	1.5	1.2
13	1.1	2.75	2.95	2.0	1.9	1.5	1.5	1.0
14	1.25	2.65	2.8	2.0	1.95	1.5	1.5	1.0
15	1.3	2.4	2.8	2.1	1.9	1.4	1.5	1.0
16	1.3	2.3	2.9	2.15	1.75	1.25	1.5	1.0
17	1.25	2.3	2.8	2.15	1.45	1.35	1.4	1.0
18	1.25	2.4	2.85	2.2	1.45	1.5	1.25	1.0
19	1.25	2.65	2.9	2.4	1.4	1.5	1.3	1.0
20	1.2	2.6	2.85	2.15	1.25	1.45	1.45	1.05
21	1.35	2.5	2.8	2.05	1.35	1.45	1.5	.95
22	1.25	2.35	2.8	1.95	1.35	1.45	1.35	.85
23	1.3	2.55	2.7	2.15	1.25	1.2	1.4	.75
24	1.1	2.95	2.65	2.35	1.35	1.1	1.4	.85
25	1.1	3.1	2.75	2.2	1.25	1.1	1.4	1.05
26	1.1	3.45	2.65	2.1	1.4	1.1	1.35	1.1
27	1.1	3.65	2.75	2.0	1.35	1.15	1.45	.....
28	1.25	3.6	2.8	1.9	1.35	1.35	1.35	.....
29	1.35	3.6	2.6	1.85	1.6	1.35	1.3	.....
30	1.35	3.65	2.4	1.75	1.5	1.3	1.2	.....
31	.....	3.75	.....	1.7	1.55	.....	1.2	.....

Daily discharge, in second-feet, of Cache la Poudre River at mouth of canyon, near Fort Collins, Colo., for 1913.

Day.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	180	2,060	660	300	235	130	145
2	.....	180	1,725	590	300	235	162	145
3	.....	162	1,598	590	325	255	215	145
4	.....	145	1,598	590	145	198	255	145
5	.....	198	1,535	590	375	198	255	145
6	.....	255	1,358	590	400	215	235	180
7	.....	350	1,190	520	375	180	198	115
8	.....	400	1,190	490	375	430	162	90
9	.....	430	1,245	490	350	375	198	90
10	.....	490	1,245	555	350	325	162	145
11	.....	695	1,725	625	325	300	162	198
12	80	900	1,475	520	375	278	215	115
13	90	1,040	1,245	460	400	215	215	70
14	130	945	1,090	460	430	215	215	70
15	145	730	1,090	520	400	180	215	70
16	145	660	1,190	555	325	130	215	70
17	130	660	1,090	555	198	162	180	70
18	130	730	1,146	590	198	215	162	70
19	130	945	1,190	730	180	215	145	90
20	115	900	1,140	555	130	198	198	90
21	162	810	1,090	490	162	198	215	90
22	130	695	1,090	420	162	198	162	90
23	145	855	990	555	130	115	180	90
24	90	1,245	945	695	162	90	180	90
25	90	1,415	1,040	590	130	90	180	90
26	90	1,855	945	520	180	90	162	90
27	90	2,130	1,040	460	162	102	198	.....
28	130	2,060	1,090	400	162	162	162	.....
29	162	2,060	900	375	255	162	145	.....
30	162	2,130	730	325	215	145	115	.....
31	.....	2,270	.....	300	235	.....	115	.....

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Monthly discharge of Cache la Poudre River at mouth of canyon, near Fort Collins, Colo., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
April 12-30	162	80	123	4,640
May	2,270	145	920	56,600
June	2,060	730	1,230	73,200
July	730	300	528	32,500
August	430	130	265	16,300
September	430	90	204	12,100
October	255	115	184	11,300
November 1-26	198	40	99.6	5,140
The period				212,000

LOUP RIVER AT COLUMBUS, NEBR.

Location.—At railroad bridge in sec. 23, T. 17 N., R. 1 W., at Columbus. No tributaries between station and mouth of the river, 3 miles below.

Records available.—October 13, 1894, to December 31, 1913.

Drainage area.—13,500 square miles.

Gage.—Vertical staff gage established at Union Pacific Railway bridge November 23, 1913. The original gage was a vertical staff situated a short distance above railroad bridge and was used from October 13, 1894, to June 24, 1904. On that date a chain gage was established on highway bridge, 1½ miles downstream. The chain gage was set to read the same as original staff gage, but owing to the slope of the river the datum of the chain gage was 8.56 feet lower. The chain gage was used until November 21, 1913.

Control.—Extremely shifting.

Discharge measurements.—Made from highway bridge and later from railroad bridge.

Winter flow.—Ice causes backwater during winter months; observations discontinued.

Diversions.—Prior to September 1, 1912, there were approved diversions of 1,764 second-feet for irrigation and 4,700 second-feet for power from Loup River above station. There were also approved diversions of 2,046 second-feet for irrigation and 3,130 second-feet for power from tributaries entering above.

Accuracy.—Though the channel is extremely shifting, sufficient measurements have been made to insure fair estimates of discharge.

Cooperation.—Field data for 1913 furnished by the State engineer.

Discharge measurements of Loup River near Columbus, Nebr., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 19	D. P. Weeks, jr.	4.70	4,620	July 28	D. P. Weeks, jr.	4.45	2,230
Apr. 6	.....do	4.65	3,420	Aug. 5	.....do	4.10	1,570
13	.....do	4.60	3,900	12	.....do	4.60	2,250
20	.....do	4.50	3,490	20	.....do	4.30	1,650
27	.....do	4.45	3,760	27	.....do	4.30	1,610
May 4	.....do	4.40	4,720	Sept. 3	.....do	4.30	1,690
11	.....do	4.60	4,730	9	.....do	4.30	1,720
18	.....do	4.60	3,570	18	Weeks and Follansbee	4.44	2,060
25	.....do	4.50	3,000	28	D. P. Weeks, jr.	4.54	2,070
June 8	.....do	4.50	2,600	Oct. 4	.....do	4.52	2,210
18	.....do	4.80	2,870	Nov. 9	.....do	4.65	2,500
25	.....do	4.50	2,080	28	.....do	a 3.70	4,560
July 2	.....do	4.55	2,180	29	W. M. Jefferys	a 3.60	2,370
10	.....do	4.85	3,250	Dec. 12	.....do	a 3.20	3,750
16	.....do	4.10	1,640				

a New gage established Nov. 23, 1913.

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Daily gage height, in feet, of Loup River at Columbus, Nebr., for 1913.

[W. D. Benson, observer.]

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	4.65	.....	4.7	.....	4.3	4.3	4.5	4.55	3.75
2	.....	4.75	.....	5.0	4.6	4.2	4.35	4.3	4.55	3.78
3	.....	4.65	5.5	5.05	4.55	4.0	4.35	4.4	4.45	3.75
4	.....	4.95	4.95	4.8	4.4	4.1	4.4	4.45	4.65	3.85
5	.....	4.8	4.4	5.0	4.4	4.1	4.35	4.5	4.75	3.88
6	.....	4.7	.....	4.75	5.35	4.1	4.35	4.5	4.6	4.2
7	.....	4.65	4.45	4.85	4.65	4.2	4.4	4.5	4.55	4.5
8	.....	4.5	4.4	4.5	4.55	4.25	4.4	4.55	4.55	4.1
9	5.75	4.9	4.45	4.5	4.45	.....	4.35	4.45	4.55	3.7
10	5.7	4.95	4.55	4.45	4.75	4.65	4.4	4.5	4.55	3.55
11	5.5	4.55	4.6	4.3	4.4	4.6	4.4	4.5	4.45	3.5
12	4.75	4.5	4.55	4.3	4.2	4.65	5.15	4.55	4.45	3.2
13	4.75	4.55	4.45	4.25	4.2	4.55	4.65	4.6	4.5	3.35
14	.....	4.5	4.7	4.25	4.3	4.6	4.35	4.7	4.5	3.42
15	.....	4.65	4.95	4.3	4.25	4.9	4.35	4.55	4.65	3.48
16	3.8	4.7	4.75	4.55	4.15	4.6	4.35	.....	4.55	3.5
17	3.95	4.75	4.65	4.85	4.05	4.6	4.4	4.6	4.55	3.5
18	4.45	4.8	4.6	4.8	4.1	4.55	.....	4.55	4.4	3.5
19	4.95	4.8	.....	4.45	4.25	4.4	4.4	4.6	4.7	3.32
20	.....	4.65	4.65	.....	4.95	4.35	4.45	4.5	4.75	3.5
21	3.6	4.65	4.7	4.6	4.75	4.35	4.55	4.65	4.75	3.55
22	3.7	4.5	4.45	4.45	4.45	4.35	4.55	4.6	.....	.....
23	4.0	.....	4.5	4.7	4.35	4.4	4.45	4.5	.....	2.75
24	5.1	5.05	4.25	4.65	.....	4.45	4.35	4.55	3.85	2.8
25	4.8	4.7	4.55	4.55	4.3	4.4	.....	4.55	3.72	.....
26	4.1	4.65	4.55	4.55	4.3	4.4	4.45	4.55	3.68	.....
27	4.55	4.5	4.5	.....	4.35	4.3	4.55	4.75	3.6	3.55
28	4.45	4.4	4.45	4.3	4.5	4.3	4.5	.....	3.75	3.7
29	4.5	4.4	4.3	.....	4.35	4.2	4.6	4.5	3.65	3.68
30	4.65	4.35	4.3	4.25	4.3	4.2	4.55	.....	3.75	.....
31	4.65	.....	4.35	.....	4.3	4.2	.....	4.4	.....	4.15

NOTE.—Gage heights Nov. 23 to Dec. 31 refer to gage established Nov. 23, 1913. Ice present Dec. 20 to 31.

Daily discharge, in second-feet, of Loup River at Columbus, Nebr., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
1	.....	3,560	6,160	4,040	1,980	1,870	1,680	2,080	2,220
2	.....	4,080	8,580	5,780	2,350	1,700	1,760	1,680	2,220
3	.....	3,460	11,000	6,020	2,220	1,530	1,760	1,850	1,980
4	.....	5,300	8,500	4,460	1,850	1,600	1,850	1,980	2,510
5	.....	4,210	4,560	5,600	1,850	1,600	1,760	2,080	2,869
6	.....	3,720	4,520	4,040	5,750	1,600	1,760	2,080	2,350
7	.....	3,560	4,490	4,580	2,510	1,700	1,850	2,080	2,220
8	.....	2,900	3,980	2,600	2,210	1,780	1,850	2,220	2,220
9	.....	5,440	4,100	2,550	1,980	2,270	1,760	1,980	2,220
10	.....	5,930	4,560	2,270	2,860	2,760	1,850	2,080	2,220
11	.....	3,460	4,750	1,780	1,900	2,480	1,850	2,080	1,980
12	.....	3,300	4,230	1,740	1,610	2,510	4,750	2,220	1,980
13	.....	3,680	3,450	1,590	1,640	2,220	2,510	2,350	2,080
14	.....	3,400	4,820	1,550	1,820	2,350	1,760	2,670	2,080
15	.....	4,280	6,420	1,600	1,760	3,500	1,760	2,220	2,510
16	.....	4,600	4,750	2,240	1,650	2,350	1,760	2,280	2,220
17	.....	4,950	3,920	3,500	1,560	2,350	1,850	2,350	2,220
18	.....	5,300	3,550	3,050	1,600	2,220	2,080	2,220	1,850
19	6,380	5,300	3,680	1,980	1,780	1,850	1,850	2,350	2,670
20	5,260	4,280	3,820	2,160	4,380	1,760	1,980	2,080	2,980
21	1,120	4,280	4,100	2,350	3,380	1,760	2,220	2,510	2,980
22	1,180	3,400	2,780	1,960	2,240	1,760	2,220	2,350	3,710
23	1,570	5,380	3,000	2,670	1,980	1,850	1,980	2,080	4,360
24	7,200	7,350	1,950	2,510	1,920	1,980	1,760	2,220	4,120
25	4,950	5,020	3,280	2,220	1,870	1,850	1,860	2,220	3,520
26	1,710	4,880	3,280	2,220	1,870	1,850	1,980	2,220	3,460
27	3,300	4,100	3,000	1,950	1,980	1,680	2,220	2,860	3,100
28	2,770	3,680	2,780	1,680	2,370	1,680	2,080	2,470	2,740
29	2,950	3,860	2,150	1,650	1,980	1,570	2,350	2,080	2,270
30	3,680	3,740	2,150	1,620	1,870	1,570	2,220	1,980	2,500
31	3,620	.....	2,350	.....	1,870	1,570	.....	1,850	.....

NOTE.—Discharge determined from a series of parallel curves and by indirect method for shifting channels.

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Monthly discharge of Loup River at Columbus, Nebr., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 19-31	7,200	1,120	3,510	90,500	C.
April	7,350	2,900	4,350	259,000	C.
May	11,000	1,950	4,340	267,000	C.
June	6,020	1,550	2,800	167,300	C.
July	5,750	1,560	2,210	136,000	B.
August	3,500	1,530	1,970	121,000	B.
September	4,750	1,680	2,030	121,000	B.
October	2,860	1,680	2,180	134,000	B.
November	4,560	1,850	2,620	156,000	B.
The period				1,450,000	

ELKHORN RIVER NEAR ARLINGTON, NEBR.

Location.—At highway bridge in sec. 15, T. 17 N., R. 9 E., one-half mile from Arlington. Nearest tributary, Bell Creek, enters 2 miles below.

Records available.—July 11 to December 31, 1913. From April 28, 1899, to November 21, 1903, a station was maintained at the old bridge, situated just above the present one.

Drainage area.—5,980 square miles.

Gage.—Vertical staff.

Control.—Data too meager to determine.

Discharge measurements.—Made from single-span bridge.

Diversions.—Prior to September 1, 1912, there were approved diversions from Elkhorn River of 147 second-feet for irrigation and 538 second-feet for power, all above the station. From tributaries entering above there were approved diversions of 174 second-feets for power development.

Accuracy.—Conditions favorable for accurate results; estimates considered reliable.

Cooperation.—Field data furnished by State engineer.

Discharge measurements of Elkhorn River near Arlington, Nebr., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
July 9	D. P. Weeks, jr.	2.00	590	Nov. 16	D. P. Weeks, jr.	2.15	453
Aug. 5	.....do.....	1.60	300	28	Jefferys and Weeks.	2.20	470
Sept. 8	.....do.....	1.50	219	Dec. 19	W. M. Jefferys.	2.25	843
17	Follansbee and Weeks.	1.60	264				

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Daily gage height, in feet, and discharge, in second-feet, of Elkhorn River near Arlington, Nebr., for 1913.

[Gerald Berry, observer.]

Day.	July.		August.		September.		October.		November.		December.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	1.65	315	1.5	220	1.9	413	2.1	400	2.3	554
2	.....	.....	1.6	280	1.5	220	1.9	406	2.1	400	2.3	572
3	.....	.....	1.6	280	1.5	220	1.9	399	2.2	480	2.35	640
4	.....	.....	1.6	280	1.45	192	1.85	357	2.2	480	2.3	610
5	.....	.....	1.6	280	1.5	220	2.0	460	2.2	480	2.35	680
6	.....	.....	1.6	280	1.4	165	1.9	378	2.2	480	2.5	850
7	.....	.....	1.6	280	1.4	165	1.9	371	2.2	480	2.5	870
8	.....	.....	1.6	280	1.5	220	1.9	364	2.2	480	2.5	890
9	.....	.....	1.7	350	1.4	165	2.0	428	2.15	440	2.45	860
10	.....	.....	1.7	350	1.4	165	1.95	385	2.1	400	2.45	880
11	2.0	500	1.8	420	1.5	220	1.9	343	2.1	400	2.4	850
12	1.9	500	1.8	420	1.5	220	2.0	406	2.15	440	2.4	870
13	1.8	420	2.0	500	1.5	220	1.9	329	2.2	480	2.4	890
14	1.8	420	2.1	600	1.5	220	1.9	322	2.2	480	2.35	880
15	1.8	420	2.05	640	1.6	280	1.95	350	2.2	480	2.35	880
16	1.8	420	2.05	640	1.6	280	1.9	308	2.2	480	2.3	850
17	1.8	420	2.0	500	1.6	280	1.95	336	2.2	480	2.35	925
18	1.75	385	1.9	500	1.6	280	2.0	364	2.2	480	2.25	940
19	1.7	350	2.0	500	1.6	280	2.0	357	2.2	480	2.25	840
20	1.75	385	1.9	500	1.6	280	2.0	350	2.2	480	2.4	1,000
21	1.8	420	1.85	460	1.65	308	1.9	274	2.2	480	1.8	420
22	1.65	315	1.85	460	1.7	336	2.0	336	2.3	580	2.2	790
23	1.75	385	1.7	350	1.6	252	2.0	329	2.3	580	2.0	580
24	1.7	350	1.65	315	1.6	256	2.0	322	2.25	530	2.0	580
25	1.7	350	1.6	280	1.8	385	2.0	315	2.25	530	2.15	740
26	1.7	350	1.6	280	1.8	378	2.05	350	2.25	530	2.45	.....
27	1.7	350	1.6	280	1.8	371	2.1	400	2.25	530	2.55	.....
28	1.75	385	1.6	280	1.8	364	2.1	400	2.25	530	2.8	.....
29	1.7	350	1.55	250	1.85	392	2.1	400	2.25	530	2.75	.....
30	1.7	350	1.5	220	1.85	385	2.1	400	2.3	580	2.6	.....
31	1.7	350	1.5	220	.....	.....	2.1	400	.....	.....	2.6	.....

NOTE.—Gage heights Dec. 26-31 are probably affected by ice, though observer makes no note. Discharge determined from two well-defined curves.

Monthly discharge of Elkhorn River near Arlington, Nebr., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
July 11-31	500	350	394	16,400	A.
August	600	220	385	23,700	A.
September	392	165	265	15,800	B.
October	460	274	366	22,500	C.
November	580	400	487	29,000	A.
December 1-25	1,000	420	774	38,400	C.
The period	.....	.....	.....	146,000	

ELKHORN RIVER AT WATERLOO, NEBR.

Location.—At the highway bridge half a mile north of Waterloo, on the line between secs. 3 and 10, T. 15 N., R. 10 E. No tributary within several miles.

Records available.—May 19, 1911, to July 19, 1913.

Drainage area.—Not measured.

Gage.—Reference point on bridge from which distance to water surface is measured.

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Control.—Shifting.

Discharge measurements.—Made from the highway bridge.

Winter flow.—No data.

Diversions.—Prior to September 1, 1912, there were no approved diversions from Elkhorn River between Waterloo and Arlington, and none below Waterloo.

Accuracy.—Estimates obtained by indirect method for shifting channels; can be considered good.

Cooperation.—Field data furnished by State engineer.

Discharge measurements of Elkhorn River at Waterloo, Nebr., in 1913.

[D. P. Weeks, jr., hydrographer.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Mar. 17	2.75	1,440	May 3	4.70	2,430	June 7	3.25	1,430
Apr. 12	3.52	2,030	May 10	3.90	2,150	June 17	2.50	901
Apr. 19	4.40	3,010	May 17	6.00	5,070	June 28	2.60	1,060
Apr. 27	4.97	3,200	May 24	4.35	2,890	July 3	2.06	735

Daily gage height, in feet, and discharge, in second-feet, of Elkhorn River at Waterloo, Nebr., for 1913.

[John Todd, observer.]

Day.	March.		April.		May.		June.		July.	
	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.	Gage height.	Discharge.
1	.....	.....	3.07	1,640	3.90	1,760	3.88	2,080	2.23	815
2	.....	.....	3.00	1,590	4.05	1,830	3.80	2,000	2.15	780
3	.....	.....	3.14	1,690	4.74	2,480	3.96	2,160	2.08	754
4	.....	.....	3.15	1,700	4.80	2,660	3.77	1,970	1.98	724
5	.....	.....	3.10	1,660	5.57	3,780	3.60	1,800	2.10	760
6	.....	.....	3.16	1,710	5.15	3,280	3.50	1,700	1.95	715
7	.....	.....	3.23	1,760	4.58	2,640	3.23	1,460	2.20	800
8	.....	.....	3.20	1,740	4.15	2,210	3.10	1,350	2.00	730
9	2.55	1,320	3.33	1,850	4.15	2,300	3.27	1,490	1.95	715
10	3.25	1,780	3.50	2,000	3.90	2,100	3.00	1,270	1.90	700
11	3.38	1,890	3.57	2,070	3.70	1,900	2.90	1,200	1.80	670
12	3.78	2,290	3.56	2,060	3.62	1,820	2.85	1,160	1.68	646
13	3.28	1,800	3.45	1,960	3.90	2,100	2.60	1,000	1.66	642
14	3.25	1,780	3.55	2,050	4.58	2,900	2.57	985	1.60	630
15	3.14	1,690	3.90	2,430	5.10	3,600	2.45	925	1.60	630
16	3.00	1,590	4.25	2,850	5.35	3,980	2.43	915	1.59	628
17	2.78	1,440	4.50	3,170	5.83	4,760	2.50	950	1.54	621
18	2.85	1,480	4.60	3,300	6.15	5,340	2.64	1,020	1.53	620
19	3.14	1,690	4.49	3,160	5.36	3,990	2.60	1,000	1.48	612
20	3.25	1,780	4.20	2,790	5.30	3,900	2.50	950	.....	.....
21	3.32	1,840	3.95	2,420	5.40	4,050	2.60	1,000	.....	.....
22	2.70	1,400	3.75	2,120	5.20	3,750	2.37	885	.....	.....
23	2.83	1,470	3.90	2,200	4.85	3,260	2.45	925	.....	.....
24	3.65	2,150	3.75	2,000	4.35	2,620	2.30	850	.....	.....
25	4.14	2,720	4.20	2,410	4.34	2,610	4.63	2,970	.....	.....
26	3.88	2,410	4.90	3,200	4.20	2,440	3.54	1,740	.....	.....
27	3.50	2,000	5.05	3,310	4.01	2,250	3.00	1,270	.....	.....
28	3.18	1,720	4.76	2,860	4.00	2,200	2.53	965	.....	.....
29	3.15	1,700	4.50	2,680	4.00	2,200	2.47	935	.....	.....
30	3.16	1,710	4.15	2,030	3.98	2,180	2.36	880	.....	.....
31	3.20	1,740	.....	.....	3.86	2,060	.....	.....	.....	.....

NOTE.—Discharge determined from two fairly well-defined rating curves and by indirect method for shifting channels.

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Monthly discharge of Elkhorn River at Waterloo, Nebr., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 9–31	2,720	1,320	1,800	82,100	B.
April	3,310	1,590	2,270	135,000	B.
May	5,340	1,760	2,870	176,000	B.
June	2,970	850	1,330	79,100	A.
July 1–19	815	612	694	26,200	B.
The period				498,400	

KANSAS RIVER BASIN.

REPUBLICAN RIVER AT CULBERTSON, NEBR.

Location.—At highway bridge in sec. 20, T. 3 N., R. 31 W., south of Culbertson, Nebr. Nearest tributary, Frenchman River, enters a short distance below.
Records available.—June 15 to December 12, 1913.
Drainage area.—Not measured.
Gage.—Vertical staff.
Control.—Data too meager to determine.
Discharge measurements.—Made from bridge.
Winter flow.—Ice causes backwater during winter months; records discontinued.
Diversions.—There are adjudicated decrees amounting to 165 second-feet from the Republican, in Colorado, and approved diversions of 434 second-feet in Nebraska above the station. Below there are approved diversions of 582 second-feet.
Accuracy.—Station not completely rated; base data only available
Cooperation.—Field data furnished by State engineer.

Discharge measurements of Republican River at Culbertson, Nebr., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 12	D. P. Weeks, jr.		[a] 6.0	Sept. 13	D. P. Weeks, jr.		0
July 21	do		0	Nov. 7	do		0
Aug. 14	do		0	Dec. 3	W. M. Jefferys	1.1	122

[a] Discharge estimated.

Daily gage height, in feet, of Republican River at Culbertson, Nebr., for 1913.

Day.	June.	Nov.	Dec.	Day.	June.	Nov.	Dec.	Day.	June.	Nov.	Dec.
1			0.9	11		1.8	0.9	21	0.2	1.2	0.9
2			.9	12		1.8	.9	22	.0	1.1	.9
3			1.1	13		1.9	.9	23	.0		.9
4			1.2	14		1.9	.9	24	.2		.9
5			1.3	15	0.4	1.9	.9	25	.0		.9
6			1.5	16	.3	1.9	.9	26	.0		.9
7			1.6	17	.4	1.9	.9	27	.0		.9
8			1.2	18	.0	1.9	.9	28	.0		
9			.9	19	.0	2.0	.9	29			
10		1.6	.9	20	1.8	1.1	.9	30		.9	

NOTE.—River dry June 29 to Nov. 9.
NOTE.—Ice present Dec. 13 to 31; gage heights to top of ice.

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REPUBLICAN RIVER AT BOSTWICK, NEBR.

Location.—At highway bridge about 1 mile southwest of Bostwick, on the line between secs. 22 and 23, in T. 1 N., R. 8 W. Nearest tributary, a small intermittent stream which enters a short distance below.

Records available.—June 6, 1904, to December 31, 1913. From June 20, 1896, to November 30, 1903, a station was maintained at Superior, 10 miles downstream. As there are no important tributaries or diversions between, the records at the two points are very nearly comparable.

Drainage area.—23,300 square miles.

Gage.—Chain gage.

Control.—Shifting at intervals.

Discharge measurements.—Made from bridge.

Winter flow.—Discharge relation affected by ice; observations discontinued.

Diversions.—Prior to September 1, 1912, there were approved diversions of 862 second-feet for irrigation and 150 second-feet for power from Republican River above Bostwick station.

Accuracy.—During 1913 channel did not shift to any great extent; estimates of discharge should be reliable.

Cooperation.—Field data for 1913 furnished by the State engineer.

Discharge measurements of Republican River at Bostwick, Nebr., in 1913.

[Hydrographer, D. P. Weeks, jr.]

Date.	Gage height.	Discharge.	Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Apr. 5	2.20	700	Aug. 15	0.60	12
May 3	2.90	1,340	Nov. 8	.98	34
June 15	1.50	257	Dec. 4	1.30	132
July 22	1.10	41			

Daily gage height, in feet, of Republican River at Bostwick, Nebr., for 1913.

[J. W. Keifer, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.5	.....	.....	2.3	2.1	1.7	1.5	0.8	0.40	1.0	0.95	1.55
2	2.4	.....	.....	2.3	2.1	1.7	2.3	.8	.4	.95	.95	1.3
3	2.4	.....	2.5	2.2	3.1	1.7	2.5	.8	.4	.9	.95	1.3
4	2.3	.....	2.6	2.2	2.3	1.7	2.1	.8	.4	.9	.95	1.3
5	2.3	.....	2.8	2.2	3.45	1.8	1.8	.7	.4	.85	.95	1.3
6	.....	.....	2.8	2.1	3.3	1.7	1.6	.7	.4	.85	1.0	2.0
7	.....	.....	3.0	2.1	3.3	1.75	1.5	.7	.4	1.3	1.0	2.1
8	.....	.....	2.7	2.1	3.4	1.7	1.4	.7	.5	1.1	1.0	1.75
9	.....	.....	3.1	2.1	3.4	1.6	1.2	.65	.55	1.1	1.0	1.75
10	.....	.....	2.8	2.1	4.3	1.7	1.2	.65	.55	1.1	.95	1.85
11	.....	.....	2.5	2.2	3.2	1.95	1.2	.6	.5	1.0	.95	2.0
12	.....	.....	2.5	2.2	2.8	1.8	1.75	.6	.68	.95	1.0	2.05
13	.....	.....	2.3	2.3	2.6	1.7	1.5	.6	.9	.95	1.0	2.0
14	.....	.....	2.3	2.3	2.4	1.6	1.3	.55	.9	.9	1.0	1.95
15	.....	.....	2.3	2.2	2.3	1.5	1.2	.55	.8	.9	1.0	1.9
16	.....	.....	2.3	2.3	2.3	1.5	1.1	.5	.8	.9	1.0	1.9
17	.....	2.4	2.5	2.3	2.65	1.4	1.0	.5	.75	.9	1.0	1.8
18	.....	2.4	2.3	2.2	2.6	1.4	1.0	.5	.7	.9	1.0	1.8
19	.....	2.2	2.0	2.2	2.4	1.4	.9	.5	.75	.9	1.0	1.8
20	.....	2.3	2.0	2.2	2.5	1.4	1.0	.45	.7	.9	1.0	2.0
21	.....	2.3	2.4	2.1	3.0	1.4	1.1	.5	.7	.9	1.0	2.3
22	.....	3.3	2.2	2.1	2.25	1.7	1.0	.45	.6	.95	1.0	2.1
23	.....	3.2	2.2	2.1	2.2	1.7	1.0	.45	.65	.95	1.0	2.0
24	.....	3.0	2.3	2.2	2.1	1.7	1.4	.4	.95	.9	1.0	2.1
25	.....	3.0	2.3	2.2	2.0	2.0	1.2	.45	1.0	.9	1.0	2.0
26	.....	3.0	2.5	2.2	2.0	1.8	1.2	.45	.95	.9	1.0	2.0
27	.....	.....	2.3	2.3	1.9	1.7	1.0	.4	.9	.9	1.0	2.0
28	.....	.....	2.5	2.2	1.9	1.8	.9	.4	.9	.9	1.0	2.0
29	.....	.....	2.4	2.2	1.9	1.6	.9	.4	.9	1.0	1.1	2.0
30	.....	.....	2.4	2.2	1.9	1.6	.9	.4	1.0	.95	1.55	2.0
31	.....	.....	2.3	.....	1.8	.....	.8	.4	.....	.9	.....	2.0

NOTE.—Ice present Jan. 6 to Mar. 7 and Dec. 20–31.

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Daily discharge, in second-feet, of Republican River at Bostwick, Nebr., for 1913.

Day.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	780	620	350	195	18	6	30	31	228
2	.....	780	620	350	692	18	6	26	31	130
3	.....	700	1,550	350	852	18	6	22	31	130
4	.....	700	780	350	539	18	6	22	31	130
5	.....	700	1,940	415	328	15	6	20	31	130
6	.....	620	1,770	350	218	15	6	20	40	480
7	.....	620	1,770	382	168	15	6	130	40	550
8	1,140	620	1,880	350	129	15	9	66	40	328
9	1,550	620	1,880	295	68	14	10	66	40	328
10	1,240	620	2,960	350	65	14	10	66	31	395
11	960	700	1,660	515	62	12	9	40	31	480
12	960	700	1,240	415	262	12	14	31	40	515
13	780	780	1,050	350	144	12	22	31	40	480
14	780	780	870	295	80	10	22	22	40	448
15	780	700	780	240	60	10	18	22	40	415
16	780	780	780	240	45	9	18	22	40	415
17	960	780	1,100	195	30	9	16	22	40	355
18	780	700	1,050	195	30	9	15	22	40	355
19	550	700	870	195	22	9	16	22	40	355
20	550	700	960	195	30	8	15	22	40	.....
21	620	620	1,440	195	45	9	15	22	40	.....
22	700	620	740	344	30	8	12	31	40	.....
23	700	620	700	339	30	8	14	31	40	.....
24	780	700	620	334	120	6	26	22	40	.....
25	780	700	550	522	65	8	30	22	40	.....
26	960	700	550	382	65	8	26	22	40	.....
27	780	780	480	317	30	6	22	22	40	.....
28	960	700	480	370	22	6	22	22	40	.....
29	870	700	480	251	22	6	22	40	66	.....
30	870	700	480	246	22	6	30	31	228	.....
31	780	.....	415	.....	18	6	.....	22	.....	.....

NOTE.—Discharge determined from 3 fairly well defined curves and by indirect method. Discharge interpolated Mar. 21.

Monthly discharge of Republican River at Bostwick, Nebr., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March 8-31	1,550	550	859	40,900	C.
April	780	620	697	41,500	A.
May	2,960	415	1,070	65,800	A.
June	522	195	323	19,200	B.
July	852	18	144	8,850	B.
August	18	6	10.9	670	B.
September	30	6	15.2	904	B.
October	130	20	32.6	2,000	B.
November	228	31	45.0	2,680	B.
December 1-19	550	130	349	13,200	C.
The period	.....	.....	.....	196,000	

FRENCHMAN RIVER AT CULBERTSON, NEBR.

Location.—At highway bridge in sec. 17, T. 3 N., R. 31 W., at Culbertson. No tributary between the station and the mouth.

Records available.—June 15 to December 31, 1913.

Drainage area.—Not measured.

Gage.—Vertical staff.

Control.—Shifting.

Discharge measurements.—Made from pile-bent bridge.

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Winter flow.—Ice causes backwater during the winter months.

Diversions.—Prior to September 1, 1912, there were approved diversions from Frenchman River of 288 second-feet for power and 1,385 second-feet for irrigation, all above station. There were also approved diversions of 51 second-feet from Stinking Water River, which enters above.

Accuracy.—Station not completely rated; base data only available.

Cooperation.—Field data furnished by State engineer.

Discharge measurements of Frenchman River at Culbertson, Nebr., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
June 12	Weeks and McNamara.	1.1	17.4	Sept. 13	D. P. Weeks.....	[a] 1.3	14.3
July 18	D. P. Weeks.....	1.4	29.3	Nov. 7	.....do.....	1.45	33.2
Aug. 14	.....do.....	1.3	17.4	Dec. 3	W. M. Jefferys.....	1.5	17.0

[a] Observer's gage height.

Daily gage height, in feet, of Frenchman River at Culbertson, Nebr., for 1913.

[La Vaughn Crowell, observer.]

Day.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	1.4	1.2	1.1	1.3	1.2	1.3
2	.....	1.2	1.2	1.1	1.2	1.2	1.3
3	.....	1.3	1.1	1.1	1.3	1.1	1.5
4	.....	1.3	1.1	1.1	.....	.....	1.5
5	.....	1.2	1.1	1.1	.....	.....	1.6
6	.....	1.2	1.1	1.1	.....	.....	1.9
7	.....	1.2	1.1	1.1	.....	1.4	2.3
8	.....	1.2	1.1	1.1	.....	1.5	2.3
9	.....	1.2	1.1	1.1	.....	1.5	2.2
10	.....	1.2	1.2	1.3	.....	1.5	2.3
11	.....	1.1	1.2	1.3	.....	1.5	2.3
12	.....	1.1	1.2	1.3	.....	1.5	2.3
13	.....	1.1	1.2	1.3	.....	1.5	2.3
14	.....	1.2	1.2	1.3	.....	1.3	2.2
15	1.4	1.3	1.2	1.3	.....	1.3	2.1
16	1.3	1.3	1.3	1.3	1.1	1.3	2.1
17	1.4	1.2	1.3	1.3	1.2	1.3	2.1
18	1.2	1.5	1.3	1.3	1.2	1.3	2.1
19	1.3	1.2	1.3	1.3	1.2	1.3	2.2
20	2.1	1.1	1.3	1.3	1.2	1.3	2.2
21	1.8	1.1	1.5	1.3	1.2	1.3	2.1
22	1.4	1.2	1.3	.....	1.2	1.3	2.4
23	1.3	1.2	1.3	.....	1.2	.....	2.1
24	1.8	1.2	1.3	.....	1.2	.....	2.1
25	1.4	1.2	1.3	.....	1.2	.....	2.1
26	1.3	1.2	1.3	.....	1.2	.....	2.1
27	1.3	1.2	1.2	.....	1.2	.....	2.1
28	1.3	1.3	1.1	.....	1.2	.....	.....
29	1.3	1.2	1.1	.....	1.2	.....	.....
30	1.4	1.2	1.1	.....	1.2	1.3	.....
31	.....	1.2	1.1	.....	1.2	.....	.....

NOTE.—Water below gage Sept., 22–30; Oct 5–15; Nov. 4–6. Channel shifted between Oct. 5 and Oct. 15.

BIG BLUE RIVER AT BEATRICE, NEBR.

Location.—At Sixth Street Bridge at Beatrice, Nebr. Nearest tributary a small stream entering from the north a mile or more below.

Records available.—October 15, 1910, to December 31, 1913. Records of gage heights kept by United States Weather Bureau from January 1 to July 31 each year since June 1, 1905.

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Drainage area.—3,363 square miles (United States Weather Bureau).
Gage.—Chain gage, which is owned by United States Weather Bureau.
Control.—Shifting.
Discharge measurements.—Made from bridge.
Winter flow.—Ice causes some backwater during a portion of the winter months.
Flood discharge.—The highest recorded stage was 25.6 feet above present gage datum and occurred May 29, 1903.
Diversions.—Prior to September 1, 1912, there were approved diversions of 841 second-feet for power from the Big Blue above Beatrice. Below the station the approved diversions amount to 500 second-feet for power.
Accuracy.—Estimates obtained by indirect method for shifting channel; considered only approximate or possibly fair.
Cooperation.—Field data furnished by State engineer.

Discharge measurements of Big Blue River at Beatrice, Nebr., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar 22	D P Weeks, jr.	2.80	373	Aug 15	D P Weeks, jr.	2.15	140
Apr 19	do.	2.50	279	Sept 16	do.	2.00	105
May 21	do.	10.70	6,000	Nov 12	do.	2.20	252
June 23	do.	2.15	176	Dec 5	W M Jefferys.	2.55	334
July 22	do.	2.20	177				

Daily gage height, in feet, of Big Blue River at Beatrice, Nebr., for 1913.

[Herbert E. Palmer, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.4	3.4	2.8	2.6	2.5	2.7	2.6	2.4	1.9	2.4	2.2	2.7
2	2.5	2.8	2.7	2.7	2.5	2.6	2.5	2.2	1.3	2.2	1.9	2.7
3	2.4	.....	2.6	2.8	2.4	2.5	2.6	2.1	1.1	2.3	2.5	2.7
4	2.7	.....	2.6	2.5	4.0	2.6	2.4	2.2	2.0	2.2	2.1	2.6
5	2.6	.....	2.6	2.8	4.8	2.6	2.3	2.2	1.4	2.1	2.5	2.8
6	.....	.....	3.0	2.4	3.8	2.8	2.4	2.3	1.7	2.0	2.3	3.3
7	.....	2.7	2.7	2.4	3.3	4.0	2.3	2.4	1.5	2.4	2.5	3.0
8	.....	2.9	2.9	2.6	3.3	3.0	2.4	2.4	1.8	1.9	2.6	2.8
9	.....	3.0	3.0	2.5	3.2	2.6	2.5	2.2	1.4	2.1	2.3	3.3
10	.....	2.7	3.4	2.5	3.2	2.7	2.6	2.2	1.8	2.0	2.5	3.0
11	.....	2.6	3.3	2.7	3.8	2.5	2.5	2.3	1.9	2.1	2.4	2.9
12	.....	2.6	3.3	2.7	3.8	2.7	2.3	2.0	1.4	1.7	2.5	2.8
13	.....	2.7	3.1	2.5	3.4	2.6	2.2	1.9	2.1	1.9	2.4	2.8
14	.....	2.8	3.1	2.5	3.2	2.6	2.4	1.7	1.9	2.3	2.5	2.6
15	.....	2.4	3.0	2.6	3.2	2.5	2.2	2.0	1.8	2.0	2.5	2.7
16	.....	2.4	2.9	2.8	3.0	2.5	2.2	2.0	2.1	1.7	2.5	2.6
17	.....	2.5	3.0	2.7	3.2	2.6	2.4	1.9	1.9	2.2	2.5	2.6
18	.....	2.4	2.8	2.7	2.8	2.5	2.5	1.7	1.5	2.2	2.5	2.5
19	.....	2.5	2.8	2.8	2.7	2.5	2.5	2.3	1.9	2.0	2.5	2.6
20	.....	2.6	2.7	2.7	8.5	2.6	2.3	2.3	2.1	1.9	2.4	2.5
21	.....	2.6	2.9	2.6	12.9	2.6	2.2	1.7	2.0	2.0	2.5	2.3
22	.....	2.5	3.0	2.5	5.6	2.4	2.3	1.2	2.2	2.3	2.4	2.7
23	.....	2.6	2.8	2.6	4.6	2.4	2.4	2.2	2.1	2.0	2.4	2.4
24	.....	2.5	2.8	2.7	4.5	2.5	2.3	1.5	2.1	2.5	2.4	2.4
25	.....	2.8	3.0	2.7	4.8	2.7	2.0	1.8	2.3	2.4	2.4	2.5
26	2.5	2.7	2.7	2.6	3.3	4.1	2.2	2.0	2.5	2.5	2.6	2.7
27	2.6	2.4	2.6	2.5	3.1	2.6	2.2	2.1	2.6	2.2	2.5	2.4
28	2.5	2.9	2.5	2.4	3.1	2.6	2.4	2.0	2.4	2.1	2.5	2.6
29	2.5	.....	2.7	2.2	2.8	2.6	2.3	2.3	2.4	2.3	2.4	2.5
30	2.7	.....	2.4	2.5	2.8	2.6	2.0	2.2	2.2	2.3	2.5	2.8
31	.....	.....	2.5	.....	2.6	.....	2.2	2.0	.....	2.3	.....	2.6

NOTE.—Ice present Jan. 6 to Feb. 6. Low stage, Aug. 22, caused by filling of mill pond.

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Daily discharge, in second-feet, of Big Blue River at Beatrice, Nebr., for 1913.

Day.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	.....	356	302	278	295	270	220	97	185	143	355
2	.....	328	328	278	270	245	180	20	143	89	360
3	.....	302	356	255	245	270	160	5	163	230	375
4	.....	302	278	750	270	220	180	105	143	165	350
5	.....	302	356	1,080	270	200	180	29	123	280	410
6	.....	416	255	680	320	220	200	62	105	250	570
7	328	328	255	510	710	200	220	39	185	297	675
8	386	386	302	510	375	220	220	75	89	322	755
9	416	416	278	478	270	245	175	29	123	250	570
10	328	542	278	478	295	270	172	75	105	297	470
11	302	510	328	680	245	245	190	89	123	273	440
12	302	510	328	680	295	200	130	29	62	297	410
13	328	446	278	542	270	180	110	123	89	273	410
14	356	446	278	478	270	220	75	89	163	297	353
15	255	416	302	478	245	180	119	75	105	297	380
16	255	386	356	416	245	180	119	123	62	297	353
17	278	416	328	478	270	220	102	89	143	297	353
18	255	356	328	356	245	245	73	39	143	297	326
19	278	356	356	328	245	245	180	89	105	297	353
20	302	328	328	3,590	270	200	180	123	89	273	326
21	302	386	302	8,400	270	180	73	105	105	297	252
22	278	416	278	1,500	220	200	14	143	163	273	380
23	302	356	302	1,000	220	220	158	123	105	273	300
24	278	356	328	975	245	200	46	123	207	273	353
25	356	416	328	1,060	295	144	87	163	185	273	326
26	328	328	302	465	750	180	119	207	207	322	380
27	255	302	278	405	270	180	138	230	143	297	300
28	386	278	255	405	270	220	119	185	123	297	353
29	.....	328	212	320	270	200	180	185	163	273	410
30	.....	255	278	320	270	144	158	143	163	297	410
31	.....	278	.....	270	.....	180	119	.....	163	.....	353

NOTE.—Discharge determined by indirect method for shifting channels.

Monthly discharge of Big Blue River at Beatrice, Nebr., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).
	Maximum.	Minimum.	Mean.	
February 7–28	416	255	312	13,600
March	542	255	373	22,900
April	356	212	302	18,000
May	8,400	255	917	56,400
June	710	220	300	17,900
July	270	144	210	12,900
August	220	14	142	8,730
September	230	5	100	5,950
October	207	62	135	8,300
November	322	89	270	16,100
December	755	252	400	24,600
The period	.....	.....	.....	205,000

LITTLE BLUE RIVER NEAR FAIRBURY, NEBR.

Location.—At highway bridge in sec. 26, T. 2 N., R. 2 E., 1½ miles south of Fairbury. Nearest tributary a small stream entering half a mile above.

Records available.—May 23, 1908, to September 30, 1913.

Drainage area.—Not measured.

Gage.—Chain gage.

Control.—Shifting.

Discharge measurements.—Made from bridge.

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Winter flow.—Ice causes backwater for only a short time during winter months.

Regulation.—The dam of the Fairbury roller mills, 2 miles above, may control the flow to a certain extent during low-water season, causing a daily fluctuation. The gage is read once each day.

Diversions.—Prior to September 1, 1912, there were approved diversions of 180 second-feet from the Little Blue above Fairbury, but none from the intervening tributaries. There was no diversion from Little Blue River below Fairbury.

Accuracy.—Estimates made by indirect method for shifting channels; considered fair or possibly good.

Cooperation.—Field data furnished by State engineer.

Discharge measurements of Little Blue River near Fairbury, Nebr., in 1913.

Date.	Hydrographer.	Gage height.	Discharge.	Date.	Hydrographer.	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Mar. 23	D. P. Weeks, jr.	2.90	262	Aug. 16	D. P. Weeks, jr.	2.50	93
Apr. 24	do.	2.65	206	30	do.	2.00	69
May 21	do.	11.35	5,350	Sept. 15	do.	2.10	68
June 23	do.	3.00	163	Nov. 12	do.	2.35	128
July 23	do.	2.70	109	Dec. 4	W. M. Jefferys.	2.65	174

Daily gage height, in feet, of Little Blue River near Fairbury, Nebr., for 1913.

[Clark Hulbert, observer.]

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	2.8	2.7	2.9	2.6	2.6	3.1	3.4	2.5	2.0	2.4	2.5	3.1
2	3.0	2.7	3.9	2.6	2.6	3.0	3.2	2.6	1.9	2.2	2.4	2.6
3	2.4	2.8	2.5	2.6	3.2	3.1	3.0	2.5	2.0	2.3	2.6	3.1
4	2.8	3.0	3.8	2.6	5.4	3.0	3.0	2.5	2.1	2.4	2.5	3.3
5	2.6	.....	2.8	2.6	3.7	3.4	2.9	2.7	2.0	2.3	2.5	4.9
6	2.7	.....	3.6	2.5	4.0	3.4	2.8	2.5	2.2	2.4	2.5	5.6
7	.....	.....	3.1	2.6	3.6	3.4	2.9	2.4	2.0	2.3	2.5	4.4
8	.....	.....	3.3	2.6	3.3	4.5	2.8	2.5	1.9	2.3	2.6	4.1
9	.....	.....	3.5	2.7	3.9	3.8	2.8	2.4	2.1	2.4	2.5	3.6
10	.....	.....	3.4	2.7	4.8	3.4	2.7	2.5	2.1	2.3	2.4	3.3
11	.....	.....	3.2	2.8	3.6	3.3	2.7	2.6	2.0	2.3	2.5	3.0
12	.....	.....	3.1	2.7	3.6	3.5	2.7	2.5	2.1	2.3	2.5	3.0
13	.....	.....	3.0	2.6	4.0	3.4	2.6	2.5	2.0	2.4	2.3	2.9
14	.....	.....	3.2	2.6	3.3	3.3	2.7	2.4	2.1	2.4	2.4	2.7
15	.....	.....	3.8	2.6	3.1	3.3	2.6	2.4	2.0	2.4	2.4	2.8
16	.....	.....	3.0	2.5	3.0	3.2	2.6	2.4	2.3	2.5	2.3	2.8
17	.....	.....	3.0	2.6	2.9	3.2	2.6	2.5	2.2	2.4	2.4	2.7
18	.....	.....	3.0	2.6	3.8	3.1	2.6	2.4	2.1	2.3	2.3	2.7
19	.....	.....	3.3	2.7	3.2	3.0	2.6	2.5	2.2	2.4	2.3	2.8
20	.....	.....	3.1	2.5	7.75	3.1	2.6	2.4	2.3	2.4	2.4	2.9
21	.....	.....	3.0	2.6	11.5	3.0	2.6	2.4	2.1	2.5	2.5	2.6
22	.....	.....	3.1	2.5	8.2	3.0	2.5	2.4	2.1	2.4	2.5	2.9
23	.....	2.6	2.9	2.5	5.4	2.9	2.7	2.4	2.2	2.5	2.4	2.7
24	.....	2.4	2.9	2.7	4.4	3.1	2.6	2.4	2.5	2.5	2.4	2.6
25	.....	2.5	2.9	2.7	4.0	6.3	2.5	2.5	2.4	2.4	2.5	2.9
26	.....	2.7	2.8	2.8	3.7	3.9	2.5	2.5	2.3	2.4	2.4	2.9
27	.....	2.7	2.7	2.7	3.6	3.2	2.6	2.3	2.3	2.4	2.4	2.4
28	.....	2.8	2.7	2.7	3.5	3.1	2.5	2.4	2.3	2.5	2.5	2.9
29	2.8	.....	2.8	2.6	3.3	3.2	2.5	2.3	2.3	2.5	2.6	3.1
30	2.6	.....	2.7	2.7	3.2	7.5	2.5	2.0	2.3	2.4	2.8	3.0
31	2.8	.....	2.6	.....	3.2	.....	2.4	2.0	.....	2.6	.....	2.7

NOTE.—Ice present Jan. 7 to 28 and Feb. 5 to 22.

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Daily discharge, in second-feet, of Little Blue River near Fairbury, Nebr., for 1913.

Day.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	240	220	260	200	195	170	220	95	65	92	136	250
2	280	220	505	200	191	155	185	105	63	78	123	162
3	170	240	185	200	300	170	155	95	65	86	154	250
4	240	280	475	200	1,030	155	155	95	70	94	140	295
5	200	.....	240	200	410	220	140	115	65	87	142	780
6	220	.....	425	185	478	220	125	95	75	96	143	1,080
7	.....	.....	300	200	370	220	140	87	65	89	144	595
8	.....	.....	350	200	294	500	125	95	63	89	162	505
9	.....	.....	400	220	410	315	125	87	70	99	148	370
10	.....	.....	375	220	700	220	115	95	70	91	132	295
11	.....	.....	325	240	342	200	115	105	65	92	148	232
12	.....	.....	300	220	335	240	115	95	70	93	148	232
13	.....	.....	280	200	425	220	105	95	65	103	123	214
14	.....	.....	325	200	274	200	115	87	70	104	135	178
15	.....	.....	475	200	208	200	105	87	65	105	135	196
16	.....	.....	280	185	186	185	105	87	80	116	123	196
17	.....	.....	280	200	167	185	105	95	75	107	135	178
18	.....	.....	280	200	338	170	105	87	70	98	123	178
19	.....	.....	350	220	204	155	105	95	75	109	123	196
20	.....	.....	300	185	2,230	170	105	87	80	110	135	214
21	.....	.....	280	200	5,500	155	105	87	70	121	148	162
22	.....	.....	300	185	2,570	155	95	87	70	112	148	214
23	.....	200	260	185	835	140	115	87	75	123	135	178
24	.....	170	260	220	470	170	105	87	95	124	135	162
25	.....	185	260	220	365	1,270	95	95	87	115	148	214
26	.....	220	240	240	290	340	95	87	81	116	135	262
27	.....	220	220	220	265	185	105	80	81	117	135	135
28	.....	240	220	220	240	170	95	87	83	130	148	214
29	240	.....	240	200	200	185	95	80	83	131	162	250
30	200	.....	220	220	185	2,050	95	65	84	120	196	232
31	240	.....	200	.....	185	.....	87	65	.....	149	.....	178

NOTE.—Discharge determined from three parallel curves and by indirect method for shifting channels.

Monthly discharge of Little Blue River near Fairbury, Nebr., for 1913.

Month.	Discharge in second-feet.			Run-off (total in acre-feet).	Accuracy.
	Maximum.	Minimum.	Mean.		
March	505	185	304	18,700	C.
April	240	185	206	12,300	B.
May	5,500	167	651	40,000	C.
June	2,050	140	303	18,000	B.
July	220	87	118	7,260	B.
August	115	65	90.0	5,530	B.
September	95	63	73.1	4,350	B.
October	149	78	106	6,520	C.
November	196	123	141	8,390	B.
December	1,080	135	282	17,300	C.
The period	.....	.....	.....	138,000	

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MISCELLANEOUS MEASUREMENTS.

Measurements of stream flow in the Missouri River basin in 1913 at points other than regular gaging stations are listed in the following table:

Miscellaneous measurements in Missouri River drainage basin in 1913.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
June 22	Gibbon River	Madison River	Norris Soldier Station, Wyo	2.89	143
July 24	South Fork of Birch Creek.	Birch Creek	Above flow line of Swift dam reservoir, near Dupuyer, Mont.	2.2	74
Aug. 14	....do	....do	....do	2.3	152
20	....do	....do	....do	2.2	82
27	....do	....do	....do	2.1	60
Sept. 11	....do	....do	....do	1.99	48
Oct. 17	....do	....do	....do	.....	61
Dec. 5	....do	....do	....do	1.92	49
July 10	....do	....do	150 feet above mouth	.....	121
June 4	South Branch of South Fork of Birch Creek.	South Fork of Birch Creek.	Above flow line of Swift dam reservoir, near Dupuyer, Mont.	1.84	15.9
13	....do	....do	....do	1.68	11.3
24	....do	....do	....do	1.55	7.7
July 9	....do	....do	....do	1.54	6.7
23	....do	....do	....do	1.49	5.3
Aug. 14	....do	....do	....do	1.48	5.7
27	....do	....do	....do	1.42	3.7
Sept. 11	....do	....do	....do	1.41	3.6
Oct. 17	....do	....do	....do	1.44	4.4
Dec. 5	....do	....do	....do	1.43	4.3
June 3	North Fork of Birch Creek.	Birch Creek	....do	1.51	280
13	...do	....do	....do	1.32	157
24	....do	....do	....do	1.10	99
July 9	....do	....do	....do	.89	65
23	....do	....do	....do	.72	42
Aug. 13	....do	....do	....do	.70	43
20	....do	....do	....do	.68	41
27	....do	....do	....do	.62	31
Sept. 11	....do	....do	....do	.54	27
Oct. 16	....do	....do	....do	.60	32
Dec. 4	....do	....do	....do	.48	21
June 3	Bear Creek	North Fork of Birch Creek.	....do	1.15	32
13	....do	....do	....do	.89	15.8
24	....do	....do	....do	.68	7.2
July 9	....do	....do	....do	.62	4.4
23	....do	....do	....do	.55	3.6
Aug. 13	....do	....do	....do	.50	2.8
20	....do	....do	....do	.50	2.4
27	....do	....do	....do	.46	1.9
Sept. 11	....do	....do	....do	.40	1.2
Oct. 16	....do	....do	....do	.50	2.0
Dec. 4	....do	....do	....do	.40	1.2
May 1	Sheep Creek	Dupuyer Creek	1,000 feet above mouth	.....	18.6
June 27	....do	....do	.....	.....	43
July 1	....do	....do	.....	.....	14.5
7	....do	....do	.....	.....	6.0
15	....do	....do	Near mouth	.....	5.0
Aug. 8	....do	....do	¼ mile above mouth	.....	.73
15	....do	....do	....do	.....	4.8
19	....do	....do	½ mile above mouth	.....	4.0
29	....do	....do	....do	.....	1.2
Sept. 12	....do	....do	Near mouth	.....	.57
18	....do	....do	....do	.....	.31
Apr. 9	Spring Creek	Teton River	Strabane, Mont	.....	11.5
June 20	Yellowstone	Missouri	Fishing Bridge, Yellowstone National Park, Wyo.	7.86	6,890
Sept. 12	....do	....do	....do	5.11	2,140
13	Trout Creek	Yellowstone	Yellowstone National Park, Wyo	.....	8.5
13	Small creek ¼ mile above Trout Creek.	....do	....do	.....	4.9
Mar. 21	Boulder River	....do	1 mile above falls near Contact, Mont	.....	6.9
Aug. 22	North Platte River	.....	Gaging station at Saratoga, Wyo	3.65	215
Oct. 31	....do	.....	....do	4.14	479
29	French Creek	North Platte River	Gaging station near French, Wyo	1.50	14

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Miscellaneous measurements in Missouri River drainage basin in 1913—Continued.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
Oct. 29	Brush Creek	North Platte River	Gaging station near Saratoga, Wyo.	2.06	28
28	Encampment Creek.	.....do	Gaging station at Encampment, Wyo.	4.23	69
28	Cow Creek	.....do	Gaging station near Saratoga, Wyo.	2.10	8.9
28	Spring Creek	.....do	.....do	.84	16
31	Jack Creek	.....do	Blydenburgh's ranch near Saratoga, Wyo.	1.28	9.6
18	North Laramie River.	Laramie River	Gaging station near Ura, Wyo.	.88	3.9
Jan. 13	Horse Creek	North Platte River	Gaging station near Lagrange	1.20	34
Oct. 17	Wind River	Bighorn River	Gaging station at Riverton, Wyo.	4.90	587
17	Little Wind River	.....do	Gaging station above Arapahoe, Wyo	2.65	128
17	.....do	.....do	Gaging station below Arapahoe, Wyo	1.82	319
17	Little Popo Agie River.	.....do	Gaging station at Hudson, Wyo.	2.20	52
Jan. 13	South Fork of South Platte River.	South Platte River	South Platte, Colo	.....	98
Feb. 25	.....do	.....do	.....do	.....	96
Sept. 27	Geneva Creek	North Fork of South Platte River.	¼ mile below Scott Gomer Creek	.....	50
27	.....do	.....do	Gaging station at Sullivan's ranch, Colo.	.94	58
Feb. 16	Cache la Poudre River.	South Platte River.	200 feet above Big South Fork and 3½ miles below Chambers Lake, Colo.	.....	3.6
16	.....do	.....do	100 feet below Big South Fork, Colo.	.....	8.3
16	.....do	.....do	1 mile below Big South Fork, Colo.	.....	11.1
17	.....do	.....do	3 miles below Tunnel, Colo.	.....	12.9
17	.....do	.....do	1 mile above Home post office, Colo.	.....	15.3
15	.....do	.....do	Upper bridge at Fry's ranch, Colo.	.....	19.0
15	.....do	.....do	.....do	.....	19.3
15	.....do	.....do	.....do	.....	20.5
15	.....do	.....do	.....do	.....	19.4
16	.....do	.....do	.....do	.....	19.0
17	.....do	.....do	.....do	.....	21.8
15	.....do	.....do	1½ miles below upper bridge at Fry's ranch, Colo.	.....	21.1
16	Big South Fork	Cache la Poudre River.	500 feet above mouth, Colo.	.....	6.8

Miscellaneous measurements of canals in Missouri River drainage basin in 1913.

Date.	Stream.	Diverts from—	Locality.	Discharge.
May 24	Sevenmile ditch	Sevenmile Creek	Birdseye, Mont.	1.6
June 24	Croft & Bird ditch	Teton River	Strabane, Mont.	5.2
24	Farmers' Cooperative Canal Co. ditch.	.....do	.....do	41
May 24	Wolf Creek ditch	Wolf Creek	Wolf Point, Mont.	1.1
July 19	.....do	.....do	.....do	a.3
2	Little Bighorn canal	Little Bighorn River	Crow Agency, Mont.	22

a Estimated.

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